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"INSECTAE BORINQUENSES"

A REVISED ANNOTATED CHECK-LIST OF THE INSECTS OF PUERTO RICO

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"INSECTAE BORINQUENSES"

A Revision of

"INSECTAE PORTORICENSIS"

A Preliminary Annotated Check-List of the Insects of Porto Rico, with Descriptions of some News Species"

Jour. Dept. Agr. P. R. Vol. 7, No. 1 (January 1924), pp. 313, fig. 2.
San Juan, March 5, 1924

and

"FIRST SUPPLEMENT TO INSECTAE PORTORICENSIS"

Jour. Dept. Agr. P. R., Vol. 7, No. 4 (October 1924), pp. 38-43,
San Juan, August 1924.

By GEORGE N. WOLCOTT

INTRODUCTION

The earliest recorded collection of insects in Puerto Rico was made by Andrés Pedro Ledru and is reported in his "Viaje a la Isla de Puerto Rico en el Año 1797", Paris, 1810. Of the forty-six insects listed from Porto Rico under their scientific names, ten can be readily identified:

Termes morio Fabr.=

Blatta americana L.=

Grillus assimilis Fabr.=

Achaeta grillotalpa Fabr.=

Cimex victor Fabr.=

Pulex penetrans Linn.=

Elatér phosphoreus F.=

Passalus pentaphyllus Latreille=

Scarabœus tytanus Fab.=

Bembex signata Linn.=

Nasutitermes costalis Holmgren

Periplaneta americana Linn.

Grillus assimilis Fabr.

Scapteriscus vicinus Scudder

Proxys victor Fabr.

Dermatophilus penetrans Linn.

Pyrophorus luminosus Illiger

Passalus pentaphyllus Latreille

Strataegus barbigerus Chapin

Stictia signata Linn.

and one can guess at the probable identity of many of the others. Considering the time when Ledru wrote, the incompleteness of his list is not surprising, and as he lists many more species than are named, and does not omit mention of smaller and less obvious forms, such as ichneumons and ants, its real importance should not be underestimated, even though its value is mainly historic.

In 1882, Dr. Augustin Stahl of Bayamón, P. R. had published at San Juan his "Fauna de Puerto Rico", pages 82 to 102 being devoted to a discussion of the systematic classification of insects, and pages 169 to 249 to a list of specimens from Cuba, Trinidad and Porto Rico in his collection at Bayamón. Copies of his paper are now rare, and little is left of his collection, although it is reported that fragments of it still exist.

For a considerable number of years before the appearance of Stahl's paper, the German consul stationed at Mayagüez, Herr D. Leopoldo Krug, had been collecting insects, and at his instance the eminent naturalist, Dr. Juan Gundlach, made two trips to Porto Rico, and together they collected at Mayagüez and in various other parts of the Island. Their collections were sent to Berlin, where they were studied, classified and the many new species described by various specialists. Between May 1887 and September 1893, Gundlach published the sections dealing with insects of his "Fauna Porto Riqueña" in the *Anales de la Sociedad Española de Historia Natural*, Madrid, embodying the results of their work. Herr H. J. Kolbe identified their specimens of Neuroptera, described the new species and listed the entire collection. Dr. Henri de Saussure identified the Orthoptera, but at the time Gundlach published, he did not know whether Saussure had published the descriptions of the new species, the manuscript names for which he gives. Dr. Uhler identified the Hemiptera, but apparently did not publish descriptions of the new species from Porto Rico, and Gundlach notes only a few Homoptera, as Dr. Uhler identified them only to genus. Altho various specialists in small groups of Coleoptera, especially Herr G. Quedenfeldt and Herr J. Weise, identified or described new species from Porto Rico, a number of large and common species peculiar to Porto Rico, notably the *Lachnosterna*, are not even mentioned by Gundlach because he could not get them determined or described. Herr Victor Von Roeder identified the Diptera, listing and re-describing about eighty species and describing eleven new species. Dr. H. Dewitz identified the Hymenoptera, excepting the ants, and described many new species. He also listed the butterflies collected in Porto Rico, and described and listed some of the moths. He was unable to work up the entire collection of Lepidoptera, which was turned over to Herr H. B. Möschler, whose extensive paper, containing descriptions of many new species, was published posthumously by Herr M. Saalmüller. Gundlach's paper will remain a lasting monument to his energy, perseverance and industry in advancing systematic entomology in Porto Rico.

Since Gundlach's time, various workers from the United States have supplemented portions of his list. Dr. D. W. Coquillett in the Diptera, Prof. Wm. M. Wheeler in the Formicidae, Mr. Thos. H. Jones in the Coccidae, Mr. J. A. G. Rehn in the Orthoptera, Messrs. Leng and Mutchler in the Coleoptera, and Dr. Nathan Banks in the Isoptera, have published important papers.

In 1914, Mr. R. H. Van Zwaluwenburg prepared a list of all determinations of insects in the collections at the two experiment stations, giving the number of the note or determination and the host records of those at the Mayagüez (Federal) Station, of which he was at that time Entomologist. He also listed all those recorded in the literature which was available to him, but unfortunately he had neither Stahl's nor Gundlach's papers. His list was never published, but typewritten copies, together with a supplement of 15 pages, March 1915, were presented to a small number of persons or institutions especially interested.

Important advances in Entomology since the change in government in 1898 have been made in the economic field by workers at the two Experiment Stations. Since 1903, the reports of the Federal Experiment Station at Mayagüez, and a few papers devoted largely or entirely to Entomology, have contained references to many insects from an economic standpoint. Mr. O. W. Barrett was Entomologist and Botanist there from 1903 to 1905; Mr. W. V. Tower, Entomologist from 1906 to 1911, and from 1917 to 1923, Dr. C. W. Hooker in 1912, and Mr. R. H. Van Zwaluwenburg from 1914 to 1917.

With the establishment of the experiment station of the Sugar Producers' Association in 1910, an intensive study of the insect pests of sugar cane was initiated, the results of which have appeared as annual reports, lists of the insect pests of sugar cane, and as bulletins or circulars of a single insect or group of insects. Following the transfer of the station to the Insular Government, the field of entomological investigation was broadened to include all economic insects, and a great diversity of publications has appeared.

The original list, of which this is a revision, was an attempt to summarize the records in literature of the occurrence of the insects in Porto Rico, together with the records of the collections at the two experiment stations; that at Mayagüez as given by Van Zwaluwenburg in his list, which includes a number, prefixed by "P. R." if considered not of economic importance, and often host records, but with locality, usually Mayagüez or vicinity, and collector unspecified; that at Río Piedras with host and locality records (Río Piedras always implied if not specified), accession number or collector's initials and sometimes other data.

Mr. D. L. Van Dine, the first Entomologist at the Río Piedras Station, collected all the insects, mostly from sugar cane, with accession numbers of the years 1910 and 1911 (ending in—10 or—11). Mr. Thomas H. Jones collected most of the insects listed in 1912, and those numbered from 1 to 499, 700 to 999, and 1201 to 1299 in 1913; 1 to 100 and 701 to 898 in 1914, altho Mr. Van Dine made a number of collections in 1912 and a few in 1913. Mr. E. G. Smyth collected, usually at light at Guánica, those listed under 500 to 699 and 1000 to 1199 in 1913; and at Mona Island or other localities those under 1300 to 1399 in 1913; at Guánica those under 500 to 699 in 1914 and under 200 to 999 in 1915; at Río Piedras many in 1916 and most of those in 1918, 1919 and 1920. Dr. G. N. Wolcott was responsible for a few collections in 1914, those between 1 and 190 in 1915, some in 1916 and many in 1921 and 1922, those from 101 to 180 at Isabela in 1932, and many from 1933 to date. Dr. R. T. Cotton collected many of the insects, especially those in citrus groves, listed in 1916 and practically all in 1917. Messrs. R. A. Crespo, E. Nelson and L. A. Catoni collected a few of the insects listed in 1918, 1919, and 1920. Mr. J. D. More collected a few insects in 1920, and those, mostly insects of cotton, or ants, under 500 to 625 in 1921 and 1922. Mr. Francisco Seín collected many insects, mostly from coffee in 1921 and 1922, and on coffee and on other crops since, to date.

Mr. S. S. Crossman collected some insects, mostly on tobacco or at light at Aibonito, unaccessioned, but followed by his initials (SSC) and Mr. G. B. Merrill those followed by his initials. The records followed by the initials of other entomologists represent unaccessioned specimens or field notes. The records of unlabeled specimens bear their own mute testimony to the anonymity of their collectors.

Commas are used to separate the data differing in only one particular of host or locality, semicolons those differing in both host and locality, and often periods to separate the records of adult, larva and egg. Records of collections at Río Piedras (or Santurce and San Juan) are placed first and this locality is implied when none is specified.

The references to the lists of Stahl, Gundlach and the specialists who identified and listed his collections, of Van Zwaluwenburg, of Leng & Mutchler, and to the more extensive systematic papers, are given merely as the name, or initial, of the writer; those to the original of this list, to its supplement, to "Entomología Económica Puertorriqueña", and to "An Economic Entomology of the West Indies" as "IP", "IPSup", "EEP" and "EEWI" respectively; those to other references by author, with the year of publication and

page separated by a dash. When the insect was listed under another genus, or in synonymy, or incorrectly, the name under which it was listed is usually given before that of the authority for the record, and applies to all references on the same line or in the same paragraph.

All records, whether verified by later collections and determinations, or not, have been included, but the more doubtful have been enclosed in brackets. Manuscript names given by Stahl and Gundlach are included, as some of them have been validated by publication of descriptions long after the appearance of their lists.

In 1914, several entomologists from the American Museum of Natural History, New York City, collected insects in Porto Rico, and some of the larger and more common specimens of their collections were returned as a named collection, placed first in the University of Porto Rico, later at the Insular Experiment Station, and at present what remains of the collection is in the Museum at San Juan. From a list of these specimens, made by the compiler at the time of their transfer to the Station, the "AMNH" records in this list are taken.

To Dr. L. O. Howard, formerly Chief of the Bureau of Entomology, the compiler is most greatly indebted for making the preparation of the original list possible, by obtaining from the specialists in the Bureau and in the National Museum the determinations of specimens, and by authorizing personal consultation with these gentlemen. Not only did they determine specimens, but in some cases they revised the first draft of the section of the check-list which was submitted to them, in many cases adding new records of specimens or from literature not available to the compiler, and to each of them he is under deep obligation. In the paragraph preceding each order are given the names of the specialist, or specialists, who have determined specimens of insects of that order. In the body of the list, if this is the first record of the insect in Porto Rico, the name of the specialist making the determination is given immediately after the name of the insect and on the same line with it. If the insect was described from Porto Rico, the reference to the original description is given, if known, followed by "TYPE from P. R.". But if the insect has been previously recorded, the name of the specialist making the determination is usually given with the accession or interception number of the particular specimen which he determined.

Mr. John R. Johnston, the first Plant Pathologist at the Río Piedras Station identified many of the plants on which Mr. Van Dine and Mr. Jones found insects feeding. But it is to his successor, Mr. John A. Stevenson, to whom the Entomological Department is most

greatly indebted for such identifications, not only while he was in Porto Rico, but even after leaving the Island. Both of these gentlemen collected, in addition, a considerable number of insects. Mr. Carlos E. Chardón, and Dr. N. L. Britton have also determined some host plants. Since the publication of Dr. Britton's "Botany of Porto Rico and the Virgin Islands" Vol. 5 & 6, Scientific Survey of Porto Rico and the Virgin Islands, New York Academy of Sciences, pp. 626 & 663, New York, 1923 & 1930, the determination of plants by persons able to use these volumes has been greatly simplified. In practise, however, the personal aid of Mr. José I. Otero, Librarian of the Insular Experiment Station, is the readiest means of obtaining a determination of the plant host of an insect, or, if the common name in local use is known, the "Catálogo de los Nombres Vulgares y Científicos de Algunas Plantas Puertorriqueñas" by him and Rafael A. Toro, Boletín No. 37, Estación Experimental Insular, pp. 248, San Juan, 1931, will often furnish the desired information.

Five months after the publication of "Insectae Portoricensis" in March 1924, a "First Supplement" was issued, correcting some records and mistakes of various kinds in the original, and adding some new records, notably of thrips which had been identified in the meantime by Mr. A. C. Morgan, and noting generic transfers and other systematic changes suggested by Mr. Rolla P. Currie in the recorded Odonata. Even before its publication, the compiler had left Puerto Rico, and up to the present, no attempt has since been made to bring the entire list up to date.

The year 1925 marks a turning-point in the development of entomology in Puerto Rico. On March 18, 1925, a hearing was held by the Federal Horticultural Board in Washington to consider the advisability of restricting the shipment of fruits and vegetables from Puerto Rico to the mainland. As a result of this hearing, the Fruit and Vegetable Quarantine of Porto Rico, Quarantine No. 58, promulgated May 27, 1925, effective July 1, 1925, specified that all fruit and vegetables should be inspected and certified by an inspector of the Federal Horticultural Board for movement to the United States. Inspectors of the Board were sent to Puerto Rico to make these inspections, which were not confined to the plant material after it had been boxed and was at the pier, but extended back to the groves and farms where it originated.

The insects collected by these inspectors were sent to Washington for identification by specialists of the National Museum, consequently a great mass of authoritative records has since been accumulated in the files of the San Juan office of what is now the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

To. Mr. Richard Faxon, at present in charge of this office, the compiler is greatly indebted for access to these records and for permission to use them in the preparation of this revision. They are designated as "I No.", an abbreviation of Interception Number, and, as with the records of the Insular Experiment Station at Río Piedras, when no locality is specified, San Juan, Santurce or Río Piedras are understood. At first, most of the interceptions were made in the vicinity of San Juan, but soon afterwards an agent was located at Mayagüez, and considerably later one was assigned to Ponce so that collections eventually were made from all parts of the Island. The personnel of this office, from its establishment to the present, June 30, 1935, is as follows:

<i>Inspector</i>	<i>Date of Arrival</i>	<i>Date of Departure</i>
C. E. Cooley	June 1925	February 1928
Geraldus Gay	June 1925	March 1928
Stuart D. Whitelock	Oct. 1925 (at Mayagüez)	June 1929
Randolph W. Nicaise	February 1928	August 1930
Herschell Fox	August 1927	November 1928
C. P. Trotter	November 1928	May 1930
A. G. Harley	Sept. 1929 (at Mayagüez)	x
Richard Faxon	May 1930	x
A. S. Mills	December 1929	x
N. O. Berry	May 1931	August 1931
R. G. Oakley	April 1931 (at Ponce)	x
C. G. Anderson	August 1930	x

x: at present (June 30, 1935) on duty in Puerto Rico.

To Mr. A. S. Mills, of the Plant Quarantine Office, the compiler is greatly indebted for re-checking the interception records in the MS of this revision with the records of the office, but this is not to be interpreted as making him responsible for the consolidations of determinations as "sp." or "sp. nov.", which, for convenience, and lack of more exact information, are often placed together.

Dr. H. L. Dozier was Entomologist at the Insular Experiment Station during 1924-25, adding few new records to the accession catalog, but conducting extensive rearings of minute Hymenoptera from scale insects and other Homoptera, and, from time to time, even long after leaving the Island, publishing records or descriptions of new species which he collected or reared. From the time of his departure in 1925 until the appointment of Dr. M. D. Leonard in 1930, Mr. Seín was the only entomologist, and even he was away one year during this period, engaged in graduate study at Cornell University. Dr. Leonard made practically no accession records, but was most active in publishing during the time that he was in

Puerto Rico (1930-1933), his most useful publication for the preparation of this revision being "An Annotated Bibliography of Puerto Rican Entomology" Jour. Dept. Agr. P. R. Vol. 17, No. 1, p. 96. San Juan, March 1933. In each of his annual reports, one section was devoted to notes taken from his reports every month to the Insect Pest Survey of the U. S. Bureau of Entomology. In the collection of these notes, he often used the records of the local office of the Federal Horticultural Board, all such records in the present list being noted immediately following the Interception Number to which he refers: example—"on sweet potato (I No. 2051 Leonard 33-124)".

After Mr. W. V. Tower's departure from the Porto Rico Agricultural Experiment Station at Mayagüez, no successor was appointed and such entomological notes as occur in the reports of that Station thereafter usually depend for their authenticity upon Dr. Stuart T. Danforth, Professor of Zoology and Entomology at the College of Agriculture at Mayagüez. The publications of Dr. Danforth deal almost entirely with birds, but often contain extensive data on the insects eaten by them, determinations of the insect material often having been made by specialists when he was unfamiliar with the insect in question. Dr. Danforth is an enthusiastic collector of Coleoptera, and the records of his collection, preceded in this list by his name, are numerous in that order. To him the compiler is indebted for complete lists of the identified specimens in his personal collection and in that of the College, for use in preparing this revision. The College has also a considerable collection in all the larger orders, all such records in this list being preceded by "AMC", an abbreviation for Agricultural and Mechanic Arts College.

Dr. Wm. A. Hoffman, Entomologist of the School of Tropical Medicine of the University of Puerto Rico under the auspices of Columbia University at San Juan, has recently been working so exclusively on schistosomiasis that his earlier investigations on the insects attacking or annoying to man and animals, in collaboration with Dr. F. M. Root, or independently, have not been continued. To him the compiler is indebted for a careful consideration of each item given concerning the members of the groups in which he is interested.

The Scientific Survey of Porto Rico and the Virgin Islands, sponsored by the New York Academy of Sciences, has recently produced tangible results in Entomology: extensive systematic papers by James A. G. H. Rehn and Morgan Hebard on Blattidae (cockroaches) in Orthoptera, by Elsie Broughton Klots on Odonata (dragon flies), by W. T. B. Forbes on Heterocera (moths), C. H. Curran

on Diptera (flies) and Herbert Osborn on Homoptera (bugs) excepting the Sternorhynchi. Presumably the preparation of this revision should have been delayed until all orders had been thus competently treated, but such a consummation in the near future appears so unlikely that the advantages of the present publication of accumulated data seems to outweigh the disadvantages of presentation with an antiquated systematic basis in the orders not thus revised.

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ILLUSTRATIONS

The illustrations are, in considerable part, from cuts already in the possession of the Experiment Station, but, when illustrations of Puerto Rican insects had previously been published elsewhere, requests were made that the cuts be loaned for reproduction here, or, when that was not possible, that reproduction of the published illustrations be permitted. In no case was permission refused, and the compiler is most grateful to the various persons who have so wholeheartedly co-operated in illustrating this paper.

Dr. J. W. Folsom contributed the original drawing of a springtail from Puerto Rico which he had described. Dr. Herbert Osborn permitted the use of cuts belonging to the Ohio Biological Survey, and requested the New York Academy of Sciences to permit the use of many others which had been used in his latest paper. The American Museum of Natural History loaned the cuts used in the papers by Dr. H. L. Dozier, and one of a beetle, besides permitting the reproduction of individual illustrations from plates which were not otherwise available than in the plates. Mr. André Audant, Entomologist of the Service National de la Production Agricole et de l'Enseignement Rural, Port-au-Prince, Haiti, obtained permission for the loan of cuts which had originally appeared in "Entomologie d'Haiti".

THYSANURA

LEPISMIDÆ

Otenolepisma reducta Folsom, J. W., "A New Lepismid from Porto Rico". Proc. Ent. Soc. Washington, Vol. 25, No. 7-8, Oct.-Nov., 1923, pp. 169-170, (Plate 14, figs. 1-8): TYPE from Porto Rico.

from envelopes of scale-insect collection (65-23), common in libraries and with stored papers; possibly this species in dry cactus at Boquerón (GNW).

Lepisma saccharina L.

AMC: Desecheo Id. xi-27, v-27; Mayagüez xi-30, xii-30; Faro de Cabo Rojo iv-29; Río Piedras, xii-32.

Lepisma sp.—det. J. W. Folsom

Seín 30-177: producing pits in the roots of sugar-cane, bamboo and *Gynerium sagittatum*.

Seín 32a-1: "The golden brown bristle-tail is not abundant."

EEWI-155: quoting Seín.

Nicoletia sp.—det. J. W. Folsom

Seín 30-177: "A large white bristle-tail found in the soil near the cane, bamboo and *Gynerium sagittatum* (was) found to be the cause of the larger pits."

Seín 32a-1: "sufficiently abundant to cause considerable injury" to the roots of sugar-cane.

EEWI-155: quoting Seín.

COLLEMBOLA

All determinations by DR. J. W. FOLSOM.

Achorutes sp.

on cucumber roots at Jayuya (I No. 3736).

Xenylla welchi Folsom

enormously abundant in moist ditch on Station grounds, Oct. 31, 1934 (36-34). A blue-green springtail.

Entomobrya sp.

on cucumbers at Jayuya (I No. 3735); in rotten papaya fruit at Arecibo (I No. 4674).

Lepidocyrtus nigrosetosus Folsom, J. W., "Insects of the Sub-Class Apterygota from Central America and the West Indies." No. 2702. *From Proc. U. S. Nat. Mus.*, Vol. 72, Art. 6, pp. 16, pl. 8, ref. 12. Washington, D. C., 1927: TYPE from "Manatí, P. R., April 30, 1924, on wet dead leaves of "jagüey" (*Ficus laevigata*) on the ground, G. N. Wolcott, collector."

EEWI-242: when alive, purplish-pink in color; during wet weather common under dead leaf-sheaths of sugar-cane and under trash at the base of the cane stools.



Salina wolcotti Folsom. About fifty times natural size.
(After Folsom.)

Salina wolcotti Folsom 27-11 & 12: "The type material consists of an abundance of specimens collected in Porto Rico by G. N. Wolcott, after whom the species is named. He says that these springtails on corn are moderately abundant on the north side of the island, and on the south (dry) side of the island occur in enormous numbers.

"Porto Rico—Point Cangrejos, February 6, on the ground; Río Piedras, February 9, 11, 23, on Yautía; Bayamón, February

19, on canna and water hyacinth; Guánica, March 18, on cane; Bayamón, May 5; Isabela August 1, on cotton leaves; Peñuelas, August 16, on corn."

(as "Collembola, or Spring-tails") Wolcott 21-10: habits on sugar-cane, "mostly on the undersides of the tough old leaves of cane 2-3 feet high or over." "light yellowish-green, with a brown spot at the bend of the antennæ."

(as *Cremastocephalus bilobatus* Folsom MS) IPSup-38 and Wolcott 24-3: Five individuals in 3 sq. ft. of pasture at Pt. Cangrejos.

(as "an undescribed species belonging to the Thysanura, or springtails") Earle 28-181: "This minute insect is present, literally by the million, in every cane field of Porto Rico, living, all stages together, on the lower side of the older leaves, or in very dry weather retreating into the enrolled bud spindle. Its minute scarifications are the immediate cause of most of the 'ring spot' which is so common there on the older leaves."

EEWI-241 and 242: quoting F. S. Earle and the data noted above.

very abundant at the base of cotton bolls (3-34).

Cyphoderus inaequalis Folsom (TYPE from Canal Zone, in bat dung in limestone caves, headwaters of Chilibrillo River).

in moss around roots of orchids at Mayagüez (I No. 5728).

Campylothorax sp.

in *Inga* pod at Consumo (I No. 4173).

ORTHOPTERA

Rehn, James, A. G., "Notes on West Indian Orthoptera, with a List of the Species known from the Island of Porto Rico." Trans. Amer. Ent. Soc., Vol. 29, pp. 129-136. Columbus, O., April 4, 1903.

Rehn, James, A. G., "On Some Orthoptera from Porto Rico, Culebra and Vieques Island." Bull. Amer. Mus. Nat. Hist., Vol. 28, Art. 7, pp. 73-77. New York, March 22, 1910.

The original records in the following list of Orthoptera are based almost entirely on material determined by Mr. A. N. Caudell. To him the compiler is also much indebted for records of specimens in the National Museum which were collected in Porto Rico, and for bibliographic references to literature not available in Porto Rico.

FORFICULIDÆ

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Anisolabis ambigua Borelli

(as *Borellia janierensis* Dohrn) Burr 10-448.

Wolcott 24-22: eaten by *Anolis krugii*.

from young plant cane in the ground (443-12), from dead seed-cane in the ground at Fajardo (232-12); from chayote at Mayagüez (I No. 1827).

Anisolabis annulipes Lucas

Burr 10-447.

Wolcott 24-28: eaten by *Anolis cristatellus*.

in shelled peas (I No. 978); under dead leaves (I No. 5908); in rotten pods of *Inga laurina* (I No. 1250 Leonard 32-143); in summer squash at Manatí (I No. 1000), at Vega Baja (I No. 3589).

Anisolabis maritima Gene

Burr 10-448:

AMC: Guánica, ii-27, Mayagüez xii-34, and at many other localities.

Anisolabis minuta Caudell, A. N. (as *Borellia*), Jour. N. Y. Ent. Soc., Vol. 15, p. 168. New York, 1907: TYPE from P. R. Burr 10-448.

Labia curvicauda Motschler

Wolcott 21-13: under leaf-sheaths of sugar cane.

on coconut at San Lorenzo (12-21); under leaf-sheath of sugar cane at Mameyes (GNW).

Labia dorsalis Burmeister

abundant under bark of dead bucare tree, *Erythrina glauca*, at Cayey (305-17).

Prolabia arachnidis Yersin—det. A. N. Caudell

on yautía (I No. 819).

Prolabia unidentata P. B. (brachypterous form)

under bark of dead bucare tree, *Erythrina glauca*, at Cayey (306-17. GNW); under banana plants at Cayey (19-21).

Labidura bidens Olivier

(as *L. riparia* Pall.) Gundlach, "se encuentra debajo de las cortezas sueltas de los árboles muertos."

(as *L. dufouri* Desm. = *L. pallipes* Duf.) Gundlach, "debajo de las cortezas sueltas."

(as *L. riparia* Pall.) Burr 10-451.

carrying honey-bee on plaza at Mayagüez (16-24).

Doru albipes F.

(as *Phaulex*) Van Z. (P. R. 1) Danforth 31-82: eaten by P. R. Pewee. Wetmore 16-62, 116: eaten by Woodpecker and Oriole.

Wolcott 24-25, 28: eaten by *Anolis stratulus* and *Anolis cristatulus*.

AMC: at Utuado, Yauco, Yabucoa, Luquillo and Mayagüez.

legs yellow and with large yellow spots at base and apex of tegmina: on sugar-cane (142-21), at Guánica (142-21); in cotton squares at Pt. Cangrejos (548-22), in cotton bolls at Vega Alta (I No. 1108); under board in garden at Guánica (EGS); at light at Bayamón (I No. 2291, 4332, 5536).

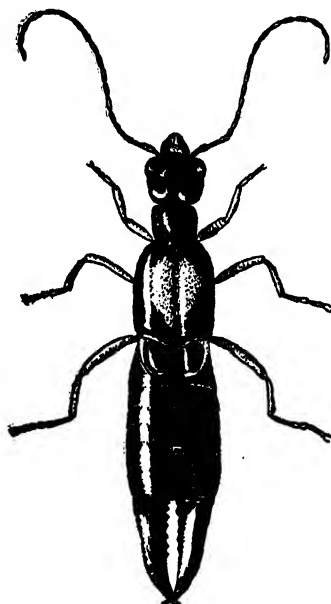
Doru lineare Esch.—det. A. N. Caudell

on flowers of *Inga laurina* at Adjuntas (I No. 3874).

Psalis americana var. *gagathina* Burmeister, G., Handbuch der Entomologie, Vol. 2, p. 753. Berlin 1838: TYPE from Porto Rico. (= *P. buscki* Rehn).

Gundlach. Burr 10-446. Van Z. (P. R. 2).

under bark of decaying bucare tree, *Erythrina glauca*, at Cayey, ovipositing (247-17); on El Duque (elev. 1600 ft.) at Naguabo (726-14); under banana plants at Vega Baja (277-22), at Maricao (Leonard 32-144).



Psalis americana P. B. Twice natural size. (Drawn by F. Maximilien.)

BLATTIDÆ

Sein, Francisco Jr., "Cucarachas". Circ. No. 64, Est. Expt. Insular. Río Piedras, P. R., pp. 12, fig. 9. San Juan, January 1928.

Rehn, James A. G. & Hebard, Maurice. "The Orthoptera of the West Indies. Number 1. Blattidæ." Bull. Amer. Mus. Nat. Hist., Vol. 54, Art. 1, pp. 320, pl. 15. New York, September 9, 1927.

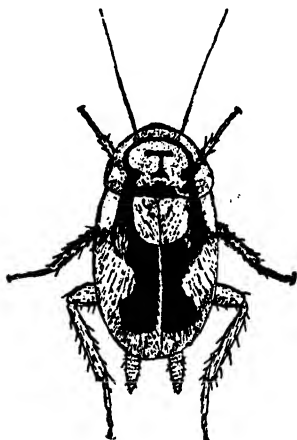
Aglaopteryx (Cerationoptera) *diaphana* F.

(as *Cerationoptera*) Rehn 10-73: from Culebra Island. AMNH at Tallaboa.

(as *Cerationoptera*) Sein 23-10: "under bark of trees, in abandoned cocoons of the 'plumilla' (*Megalopyge krugii* Dewitz), also in leaves webbed together by caterpillars and in abandoned spider nests." Illustration of adult.

(as *Cerationoptera*) Wolcott 24-25: eaten by *Anolis stratulus*.
 Danforth 26-97: abundant in nest of Grey Kingbird.
 Rehn & Hebard 27-7 & 8: at Cayey, Guayama, on Culebra and
 Mona Ids.

on rotten wood fence at Pt. Salinas (131-15); in empty co-
 coons of *Megalopyge krugii* Dewitz on trunks of bucare trees,
Erythrina glauca, at Cayey (300-17); on trunk of *Inga*
laurina at Ciales (463-21), at Adjuntas (270-22), at Lares
 (100-22); in larval tents of *Tetralopha scabridella* Ragonot
 on *Inga vera* at Lares (101-22, 151-22), at light at Hato Rey
 (89-24).



Aglaopteryx diaphana F.
 Three times natural size.
 (Drawn by F. Seín.)

***Supella supellectilum* Serville**

(as *Blatta*) Gundlach, "encontrado en las casas; Mayagüez."

Seín 23-8: in houses, with *Blatella germanica* Linn.

Rehn & Hebard 27-11: at San Juan.

in house at Condado (498-21, 139-22), at Lares (637-21,
 102-22); in hotel at Arecibo (112A-22).

***Cariblatta reticulosa* Walker**

Hebard, Martin, Trans. Amer. Ent. Soc., Vol. 22, No., p. 158,
 1916: from Aibonito, P. R.

***Cariblatta craticula* Hebard, Morgan, Trans. Amer. Ent. Soc., Vol.**
 42, No., pp. 152, 156, 163, Pl. xi, fig. 4 & 5., Pl. xii, fig. 9.
 1916: TYPE from Mayagüez, and Adjuntas, P. R.

***Cariblatta picturata* Rehn & Hebard 27-21, pl. i, figs. 2-5: TYPE**
 from Adjuntas, others from Coamo Spgs., P. R.
 (as *Cariblatta punctulata* P. B.) Hebard 16-158 (in part):
 from Adjuntas and Coamo Springs.

Cariblatta plagia Rehn & Hebard 27-36 to 38, pl. i, figs. 18-20: TYPE from Arecibo, P. R., others from Río Piedras and Manatí.

(as *Cariblatta punctulata* P. B.) Hebard 16-158 (in part); from Manatí and Río Piedras.

Cariblatta stenophrys Rehn & Hebard 27-38 to 40, pl. i, fig. 1, pl. ii, figs. 1 & 2: TYPE from Mayagüez, others from Adjuntas. (as *Cariblatta punctulata* P. B.) Hebard 16-158 in part: from Mayagüez and Adjuntas.

(referring in part or wholly to any or all of the above three species:

(as *Blatta delicatula* Guerin) Gundlach, "viene muchas veces por la noche a las casas, atraída por la luz." Stahl.

(as *Blatella*) Van Z. (P. R. 7).

(as *Neoblattella*) AMNH at Arecibo and Aibonito.

(as *Blatella*) Seín 23-11: "between the leaves of sugar cane and corn, probably feeding on the excrement of caterpillars and beetles."

(as *Cariblatta punctulata* Palisot de Beauvois) IP-19.

(as *Blatella delicatula*) Wolcott 24-27: eaten by *Anolis cristatellus*.

(189-22), under leaf-sheaths of sugar-cane (200-11, 210-11), at San Vicente (903-14), at Arecibo (16-15), at Guánica (504½-13); under leaf-sheaths of corn, possibly feeding on excrement of *Laphygma frugiperda* S. & A. (450-17, 548-17), on leaves of *Inga vera* (88-23).

Cariblattoides suave Rehn & Hebard 27-49 to 52, pl. iii, figs. 1-5: TYPE from Aibonito, others from Arecibo and Río Piedras, P. R.

(I No. 895—det. Caudell).

Neoblattella adusta Caudell, A. N., (as *Ischnoptera*) In "Canadian Entomologist" Vol. 37, p. 237, 1905: TYPE from Arroyo, P. R. Rehn & Hebard 27-79 to 80: synonymy.

(as *Blatta vitrea* Brunner) Gundlach.

(as *Latiblattella*) IP-18.

Neoblattella borinquenensis Rehn & Hebard 27-80 to 83, pl. v, figs. 11-13: TYPE from El Yunque, P. R., others from Manatí, Utuado, San Juan (137-22) and Caguas.

Neoblattella adpersicollis Stahl

Rehn, James, A. G., "The Orthoptera of the Bahamas" in Bull. Amer. Mus. Nat. Hist., Vol. 22, Art. 5, p. 110, May 23, 1906, footnote; "This is the species recorded by me as *B. punctulata* from Porto Rico (Trans. Amer. Ent. Soc. XXIX, p. 130) and *B. azteca* from Porto Rico and Jamaica (*Ibid.*, XXIX, p. 268)."

(possibly the *Blatta (Phyllodromia) caraibea* Saussure MS listed by Gundlach.)

(as *Blattella* sp.—det. Caudell) IP-19: on coffee leaves (172-21), in flower pot (137-22); on sugar-cane at Arecibo (634-21).

Neoblattella vomer Rehn & Hebard 27-83 to 85, pl. v, figs. 14-18: TYPE from Mayagüez, P. R., others from Adjuntas and San Juan (GNW).



Blattella germanica L. All stages: egg to adult.
Natural size. (After Riley.)

***Blattella germanica* Linnaeus**

(as *Blatta*) Gundlach.

(? as *Ectobia germania* ?) Van Z. (P. R. 1723).

Seín 23-7: as a pest in houses, even when kept clean: life-history and illustrations of all stages.

EEP-134: following Seín's account.

Rehn & Hebard 27-98: "a cosmopolitan domiciliary pest."
in house at Condado (489-21, 135-22).

***Ischnoptera blattoides* Saussure**

Gundlach, "durante el día escondida en las casas."

***Ischnoptera rufa* DeGeer**

Brunner, v. W. C., "Nouveau Systeme de Blattaires", 1865, p. 131.

(as *I. rufescens* Beauvois) Rehn 10-73: from Culebra Island.

(as *I. rufa rufa* DeGeer) Rehn & Hebard 27-112 to 113: from Arecibo, Ensenada.

***Symploce bilabiata* Rehn & Hebard 27-132 to 136, pl. x, figs. 6-9, TYPE from Culebra Id., others from San Juan, Dorado, Aguas Claras.**

(as *S. flagellata* Hebard) IP-20: on sugar-cane (907A-14), at Martín Peña (GNW). Wolcott 24-28: eaten by *Anolis cristatulus*.

***Symploce capitata* Saussure**

(as *Blatta*) Stahl.

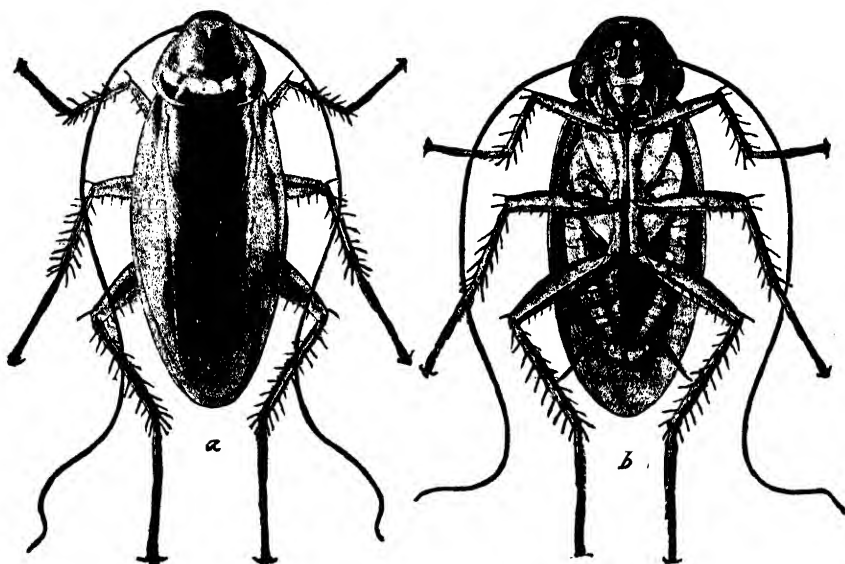
Symploce flagellata Hebard, Morgan, "Studies in the Group Ischnopterites" Trans. Amer. Ent. Soc., Vol. 42, p. 367, pl. **xxiii**, figs. 14-17, 1916: TYPE from Descecheo Id, also Mona Id. Rehn & Hebard, 27-136: "does not occur on the island of Porto Rico itself."

Pelmatosilpha coriacea Rehn, J. A. G., "Studies in American Blat-tidae." Trans. Amer. Ent. Soc., Vol. 29, p. 273, September 1903: TYPE from El Yunque, P. R.

Rehn & Hebard, 27-148 & 149, p. xi, figs. 6-11: from Adjuntas and Coamo, on Mona Id.

on sugar-cane (4-15), on bananas at the market (87-23); from orchid at Cayey (I No. 982).

Nauphoeta cinerea Oliver
Stahl.



Periplaneta americana L., a. from above, b. from beneath. One and one-third times natural size. (After Marlatt.)

Periplaneta americana L.

(as *Blatta*) Ledru 1780.

Stahl. Gundlach, "en las casas".

Sein 23-4: an extended account, life-history, parasites and illustrations of adult and eggs. EEP-171: an economic account, following Sein.

Wolcott 24-11, 28: eaten by *Ameiva exsul* and *Anolis cristatellus*.

Rehn & Hebard 27-188 to 189: at Toa Baja, Mayagüez, Adjuntas and collected by Rehn at Luquillo.

AMC: many records.

in the house (309-12, 799-14, 1044-16).

Periplaneta brunnea Burmeister

Rehn 10-75: on Culebra Id.

Seín 23-6: notes.

EEP-133: following Seín.

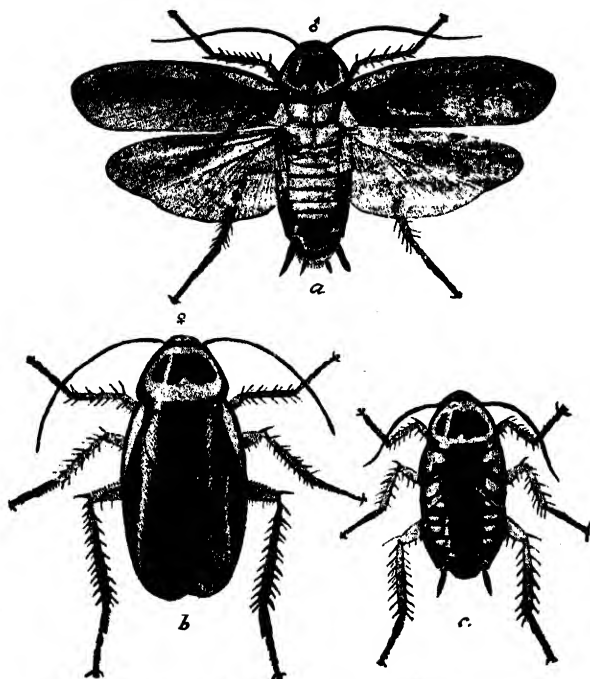
Rehn & Hebard 27-189: quoting Seín.

in the house (797-14, 33-18, 190-22, 274-22, I No. 4885).

Periplaneta australasiae F.

Gundlach "Se encuentra como plaga en las casas. De día está escondida y de noche sale; corre muy pronto y vuela."

Rehn 10-75: on Culebra Id.



Periplaneta australasiae F., a. male, b. female, c. nymph.

Natural size. (After Marlatt.)

Seín 23-7: notes and illustrations of adults and nymph.

Wolcott 24-27: eaten by *Anolis cristatelus*.

Rehn & Hebard 27-190: at Ensenada, Coamo.

in the house (4-13, 798-14).

Nyctibora lutzi Rehn & Hebard 27-193 to 194, pl. xvi, figs. 1-2:

TYPE from Guánica, P. R., ALLOTYPE from Utuado.

(as sp. nov.—det Caudell) IP-20: in rotten tree trunk, accompanied by *Nasutitermes costalis* Holmgren, large yellow ants and *Strataegus* grubs at San Sebastián (96-21); egg-capsules and nymphs between boards in a suspension bridge at Cayey, Dec. 26, 1923. One nymph collected, had the last two abdo-

minal segments dorsally and the anal plates covered with a milky mucilaginous substance, reared to adult May 26, 1924 (64-24).

Leurolestes pallidus Brunner

(as *Phoetalia laevigata* P. B.) Rehn 10-73: from Utuado.

(as *Nyctibora*) IP-20: noting the above record.

Rehn & Hebard 27-203: noting the above record, synonymy.

Epilampra mona Rehn & Hebard, 27-216 to 218, pl. xvi, figs. 12-1: pl. xvii, fig. 1: TYPE from Mona Id.

Epilampra abdomen-nigrum DeGeer

(as sp.) Wetmore 16-69: eaten by Owl, *Gymnasio nudipes*.

(as *E. wheeleri* Rehn) Seín 23-11: "abundant in malojillo meadows", notes and illustration of adult.

Rehn & Hebard 27-218 to 223, pl. xvii, figs. 2-3: coll. by Busck at San Juan, and Seín's record (187-22).

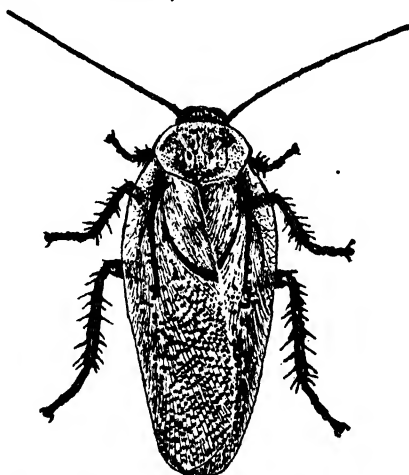
(as *E. wheeleri*) Wolcott 24-11, 21: eaten by *Ameiva caxul* and *Anolis cristatulus*.

under dead leaves in wet malojillo, *Panicum barbinode*, meadow (187-22).

Epilampra wheeleri Rehn 10-73: TYPE from Utuado, P. R.

Rehn & Hebard 27-227 to 228, pl. xvii, figs. 8-10: at Adjuntas.

(I No. 896 det. Caudell.)



Leucophaea maderae F. Natural size.

(Drawn by F. Seín.)

Leucophaea maderae F.

(as *Panchlora*) Stahl.

Gundlach, "Vive como *P. surinamensis* Linn."

Rehn 10-75: from Culebra Id.

Seín 23-8: "la Cucaracha Fatula", an extended account and illustration of the adult. EEP-135: following Seín.

EEWI-8: Seín's illustration.

AMC: Yauco ii-30, ii-31, Añasco x-30, Mayagüez, xi-30, x-30, iv-30, xii-30.

in the house (322-12, 744-14, 1007-16, 45-18, 14-20), among stored papers (442-19), on the porch (179-12, 382-12), in the storeroom, eating bananas (169-21), very abundant in fruit store, especially in room where bananas are ripened, over a bushel having been killed by the proprietor (411-21, 425-21).

***Pycnoscelus surinamensis* Linnaeus**

(as *Panchlora indica* Fabr.) Stahl.

(as *Panchlora*) Gundlach, "vive debajo de las piedras, tablas, etc.; también en las casas, en tierra".

(as *Leucophaea*) Wetmore 16-63: eaten by Woodpecker, *Melanerpes portoricensis*.

Seín 23-11: notes. Van Z. (P. R. 68).

EEP-137: following Seín.

Rehn & Hebard 27-243 to 245: at Manatí, Quebradillas, on Mona and Desecheo Ids.

in box of books (874-14), in earth in box (404-12); in earth in outdoor rearing cage at Guánica (400-14, 409-14); under flower pots in garden at Lares (103-22, 150-22); under dry cow dung at Boquerón (86-23); in potato field at Cidra (I No. 643); reared by Seín in earth, fed on corn, from nymphs "born Sept. 10, 1922, first adult and five nymphs on April 3, 1923, another adult April 11, third on April 25, June 6 last adult" (223-23).

***Panchlora cubensis* Saussure**

(as *Panchlora viridis* F. and *P. nivea* L.) Gundlach, "Vive debajo de las cortezas sueltas de los árboles muertos, o debajo de las piedras, tablas, etc."

(as *P. nivea*) AMC: Luquillo vi-32, Mayagüez xii-30, Coamo xi-30.

(as *Panchlora virescens* Thunberg). Rehn 03-131.

Rehn & Hebard 27-247 to 248: at Aibonito.

***Panchlora sagax* Rehn & Hebard 27-251 to 254, pl. xix, figs. 1-4:** (TYPE from Dominica), at Río Piedras, San Juan, Loíza, Adjuntas, Aibonito and on Culebra Id.

(as *Panchlora exoleta* Burmeister) Rehn 03-131.

(as *P. peruana* Saussure) Van Z. (P. R. 75).

(as *P. nivea* Linn.) Seín 23-12: common in rotten coconut palm, viviparous, nymphs are brown and become green adults in 100 days.

(413-16), at light (I No. 3041-B det. as *P. cubensis* Sauss. by A. N. Caudell), at Cidra (I No. 4175); in rotten interior of coconut palm by Laguna de Quiñones (256-16); (282-22, 419-22) reared adults from two females, one from rotten palm at Loíza Aldea, other from bananas; at light, second story of house (221-23).

Blaberus discoidalis Serville

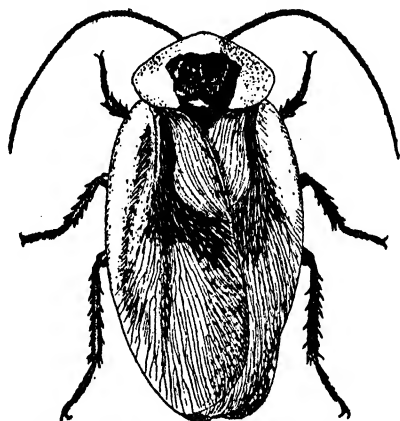
(as *B. rufescens* Sauss. & Zehntner) Rehn 03-131.

(as *B. cubensis* Saussure: Van Z. (P. R. 43).

Sein 23-12: notes and illustration of adult.

Rehn & Hebard 27-260 to 261:

(910-14, 424-21), in banana ripening room in fruit store (411-21).



Blaberus discoidalis Serville. Natural size. (Drawn by F. Maximilien.)

Hemiblabea brunneri Saussure

(as *Hemiblabea manca*) Saussure, H., Soc., Ent., Vol. 8, p. 68, Zurich, 1893: TYPE from P. R. Rehn 10-76: from Fajardo and Culebra Id.

Rehn & Hebard 27-269 to 271: at Fajardo, Boquerón and on Culebra Id.

under dry bark of tamarind tree at Boquerón (220-23).

Aspiduchus deplanatus Saussure

(as *Blabea*) Gundlach, "Debajo de las piedras y de los hojarasca; aun no observada en Cuba."

Rehn & Hebard 27-279, pl. xix, fig. 14: "in limestone cavern, by thousands in grass and walls, at Corozal."

Holocampsa nitidula F.

(as *H. collaris* Burm. and *H. cyanea* Burm., not in synonymy)

Gundlach, "en las casas debajo de las tablas y otros objetos."

Rehn & Hebard 27-281 to 282: quotes Gundlach.

Plecoptera dorsalis Burmeister

(as *P. porcellana* Saussure) Gundlach, "Vive debajo de las cortezas sueltas de árboles muertos y vuela de noche a las casas atraída por la luz."

Rehn & Hebard 27-302 to 303, pl. xxi, fig. 5 & others: at Mayagüez, Maricao, Arecibo, Cayey & Aibonito.

on flowers of pomarrosa at Aibonito (I No. 4381).

Plecoptera rhabdota Rehn & Hebard 27-305 to 307, pl. xxi, figs. 8 & 9, pl. xxii, fig. 9, pl. xxiii, fig. 7: TYPE from San Juan, ALLOTYPE from Aibonito, P. R., others from Vega Alta, Jayuya, Río Piedras, Arecibo, Mayagüez, Aibonito, and at Lares collected by F. Seín in nest of larva of *Tetralopha scabridella* on *Inga vera*.

(as *P. krugii* Saussure) Gundlach.

(as *Plecoptera porcellana* Sauss.) Van Z. (PR. 9).

Seín 23-12; notes.

Rehn 03-131: at Mayagüez.

AMC: at Mayagüez ii-27, xi-30, La Tortuguera iii-27, Coamo iii-29, xii-29, Cabo Rojo xi-30, Jojuda xi-30, La Plata iii-29, Las Marías iv-29.

(278-12), on *Psidium guajava* (305-16), on *Spondias lutea* (726-16), on grapefruit trees (459-16), at Vega Alta (47-17, 211-17); on coffee trees (79-21), at Ciales (67-21); on sugar cane at Fajardo (903-14); in caterpillar nests of *Tetralopha scabridella* Ragonot on *Inga vera* at Lares (100-22, 152-22); in old cotton bolls at Manatí (129-23); on grapefruit at Bayamón (I No. 5034), at Vega Baja (I No. 3591).

Plecoptera infulata Rehn & Hebard 27-314 to 316, pl. xxiii, fig. 11: TYPE from Mayagüez, others from Aibonito, Cayey and Río Piedras, P. R.

(as *P. poeyi* Saussure) Wetmore 16-66: eaten by P. R. Tody, *Todus mexicanus*. Rehn 03-131: from Vieques Id.

(as *P. unicolor* Burmeister) Gundlach.

at light, second story of house (222-23), on tree at Villalba (I No. 5187 det. as *P. poeyi* by A. N. Caudell).

MANTIDÆ

Gonatista grisea Fabr.

(as *G. cubensis* Saussure) Stahl.

Gundlach, "sobre los arbustos en la maleza y monte".

Van Z. (P. R. 12).

in grapefruit grove (458-16); at light at Guánica (479-14); nymph resting on trunk of coffee tree at Lares (312-22—det. GNW).

Gonatista reticulata Thunberg

Caudell, A. N., *Psyche*, Vol. 19, No. 5, pp. 160-162, 1912.

Callimantis antillarum Saussure

(as *Iris*) Stahl. Gundlach, "encima de la hierba de guinea en Mayagüez."

Wetmore 16-58, 61, 77. eaten by Mangrove Cuckoo, Ani and Kingbird.

AMC. at Coamo iii-29, Algarrobo ii-31, Mayagüez xii-26, v-30, xi-30, vii-32, Coamo Springs ix-29, vi-30, Yabucoa vi-30, v-30, Río Piedras i-32, San Germán xii-33.

resting on small tree at Ponce (I No. 4632), on *Inga laurina*, at Lares (145-22—det. GNW).

PHASMIDÆ

Dyme haita Westwood = **Bacunulus dryas** Westw.

in coffee grove at Lares (179-22), on shrub at Caguas (I No. 640), at Bayamón (I No. 2684).

Dyme krugiana Brunner, von W. C., Die Ins. Fam. del Phasmiden, p. 324, 1907: TYPE from P. R.

Dyme (Bacteria) yersiniana Saussure H., "Phasmidarum novarum species non nullæ", Rev. et Mag. Zool., (2) Vol. 20, p. 65, 1868: TYPE from P. R.

Gundlach, "en los montes o malezas".

Bacteria calamus Fabr.

(as *B. spinosus* Burm.) Haan, de Willem, "Bijdragen tot de Kennis der Orthoptera" in Verhand. de Natur. Gesch. der Nederl. Overzeesch, Bezitt. etc., Orthoptera. p. 102, Leiden, 1842.

Lamponius bocki Redtenbacher, J., "Die Ins. Fam. der Phasmiden," p. 357, 1908: TYPE from Mona Island.

Lamponius guerinii Saussure

(as *Pygirhynchus*) Gundlach, "Hemos cogido solamente una larva."

Diapherodes longiscapha Redtenbacher 08-435: TYPE from P. R. on *Inga vera* at Aibonito (I No. 4630).

Diapherodes (gigas Drury) **gigantea** Gmelin.

"occurs in Porto Rico" Caudell.

Diapherodes krugii Saussure MS name, TYPE from P. R.

Gundlach, "en Mayagüez".

Aplopus achalus Rehn, J. A. G., Proc. Acad. Nat. Sci., Philadelphia, Vol. 56, p. 68, 1904: TYPE from P. R.

Wetmore 16-58: eaten by Mangrove Cuckoo, *Coccyzus minor mesiotetes*.

Redtenbacher 08- : possibly synonymous with *A. jamaicensis* Drury.

Aplopus jamaicensis Drury

on *Inga laurina* at Lares (104-22).

Aplopus micropterus Lep. & Serv.

Haan 42-102 and 128.

Diapheromera femorata

AMC: at Luquillo vii-32.

Anisomorpha jamaicana ? Redt.—det. A. N. Caudell

at Ponce (I No. 4635).

Philabalosoma ceratocephalum Gray

(as *Acanthoderus* (*Xylodus*) *adumbratus* Saussure, H., Orth. Nov., Rev. Mag. Zool., 2nd Serie, Vol. 9, p. 62, 1859,—synonymy by Redtenbacher. TYPE from Porto Rico) Gundlach, "en Mayagüez."

Canuleius cornutus Burmeister

Haan 42-102.

Clonistria linearis Drury

Redtenbacher 08-

TETRIGIDÆ (ACRYDIIDÆ)

Paratettix frey-gessneri Bolivar

Van Z. (P. R. 8).

on malojillo grass, *Panicum barbinode*, at Pt. Cangrejos (191-22); at light (143-15, 334-21, I No. 901).

Tettix caudata Saussure

Gundlach, "en parajes húmedos, v. gr. al lado de lagunas."

ACRIDIDÆ (LOCUSTIDÆ)

Micronotus quadriundulatus Redt.—det. A. N. Caudell

at Mayagüez (I No. 4559).

Sphingonotus haitensis Saussure

Smyth 19-136: on sugar cane.

at light at Guánica (587-13) and up in the hills (137-15); on sandy waste land at Algarrobo (760-14).

Orpulella punctata De Geer

Van Z. (det. Caudell).

AMC: at Mayagüez, x-27.

in garden at Guánica (428-14, 461-14, 462-14).

Scyllina (Plectrotettix) gregarius Saussure

(as *Stenobothrus*) Gundlach.

Van Dine 13-35: eating leaves of sugar cane. Colón 19-58.

Wetmore 16-22, 61, (as sp.) 91: eaten by Cuban Green Heron, Ani and Mocking Bird.

Smyth 19-136: on sugar cane. Cotton 18-280: on beans.

(as *Scyllina*) AMNH at San Juan and Mayagüez.

Wolcott 24-11: eaten by *Ametiva exsul*.

AMC: at Mayagüez xii-26, ix-28, Ensenada ii-27, Barranquitas, xii-27.

(I No. 3845), on sugar cane (338-12, 741-12, 206-13), at Guayama (67-13); on eggplant (51-16); on grass around "El Morro" at San Juan (987-13); at light at Guánica (719B-15); on Mona Island (1318-13); on squash leaf at Manatí (I No. 658); on tomato at Cayey (I No. 3411); on the beach at Luquillo (I No. 4911-2).

Schistocerca americana Drury

on sugar cane at Guánica (719-15), at Fajardo (100-18); adults and nymphs abundant on pokeweed, *Phytolacca decandra*, at Yauco (299-21); on Mona Island (1315-13); in pasture at Boquerón (181-23).

Schistocerca columbina Thunberg

(as *Schistocerca cancellatum* Serv.) Gundlach, "vive en los campos y malezas."

(as *Acridium cancellatum* Serv.) Stahl.

(as *S. aegyptia* Thunbg.) Rehn 10-76: from Culebra and Vieques Ids., from San Juan and Adjuntas.

Van Z. (P. R. 11). AMNH at San Juan, Mayagüez and Ponce. Wetmore 16-61, 80, (as sp.) 79: eaten by Ani, Petchary and Kingbird.

Wolcott 24-11: eaten by *Ameiva cxsul*.

Cotton 18-280: on beans. Smyth 19-136: on sugar cane.

AMC: many records at many points.

on sugar cane at Humacao (55-10), at Guánica (462-14, 719-15); in garden (209-17, 569-16), on beans (1157-16); on grapefruit at Espinosa (90-15); on Mona Island (1316-13); nymph on *Phytolaccus decandra* at Yauco (40-23): on casuarina at Naguabo (I No. 4778); adults on eggplant at Juncos (I No. 1772); on asparagus at Villalba (I No. 4879); at Arceibo (I No. 2886); at Loíza (I No. 4229).

Schistocerca obscurum Fabr.

(as *Acridium*) Stahl. Gundlach.

Schistocerca pallens Thunberg

Van Dine 13-35: eating leaves of sugar cane. Colón 19-58.

Smyth 19-136: on sugar cane.

Wolcott 21-12: rare in cane fields.

on sugar cane at Guayama (68-13), at Mameyes (804-12)

on Vieques Island (GNW); on tobacco at Cayey (331-17);

at Pueblo Viejo (I No. 3850).

Schistocerca peregrinum Olivier

(as *Acridium*) Stahl. Gundlach.

TETTIGONIIDÆ (LOCUSTIDÆ)

Anaulacomera laticauda Brunner

on weeds in coffee grove at Lares (106-22), on *Inga vera* at Cayey (351-22).

Microcentrum triangulatum Brunner

Wetmore 16-58; eaten by Mangrove Cuckoo.

Smyth 19-137: on sugar cane, not common.

AMC: many records at many points.

at light (341-12, 342-12, 216-13, 10-15, 422-17, 20-19), at Aguirre (70-13); eating cotton leaves (34-34), at Ponce

(I No. 1392); on citrus crate at Mayagüez (I No. 665); on orange leaf at Bayamón (I No. 697); on grapefruit at Pueblo Viejo (456-16); nymphs feeding on Croton at Bayamón (I No. 4405); on *Phytollaca decandra* L. in mountains north of Yauco (289-21); eggs on cycad (448-19), on *Ficus* sp. (GNW), very abundant on Bougainvillea leaves at Pt. Canegrejos (GNW) laid along main veins or on margin. Nymphs are variegated and bright colored, later becoming all green except at distal end of tibiae and angles of short wings, which are brown and in the last instar are all green as are the adults.

Turpilia rugulosa Brunner

AMC: at Mayagüez, at Algarrobo ii-31, San Germán xii-32, ix-30, Ponce, xii-30, Añasco x-30.

in grapefruit grove at Vega Alta (213-17); at light (85-23).

Neoconocephalus guttatus Serville

Rehn 10-76: from Bayamón and El Yunque.

Neoconocephalus maxillosus F.

on El Yunque (54-25).

Neoconocephalus obscurellus Redtenbacher

(as *Conocephalus*) Van Z. (P. R. 5).

Neoconocephalus triops Linn., var. **macropterus** Redt. (green) and **fuscostratus** Redt. (brown)

(as *Conocephalus nieti* Saussure) Gundlach, from Mayagüez.

Wetmore 16-22, 61, 119, (as sp.) 58, 82: eaten by Cuban Green

Heron, Ani, Mozambique, Mangrove Cuckoo, and Flycatcher.

(as *Conocephalus*) Van Z. (P. R. 4).

Rehn 10-76: from San Juan and Bayamón.

(as *N. mexicanus* Saussure) Smyth 19-136: on sugar cane.

Wolcott 21-12: eggs, nymphs and adults on sugar cane.

Danforth 26-104: eaten by P. R. Grackle.

Danforth 31-49, 86: eaten by Antillean Sparrow Hawk and by P. R. Thrush.

Dexter 32-6: eaten by *Bufo marinus*.

on cane (60-12, 65-12), at Guánica (28-13, 662-14), at Toa

Baja (448-21); at light (64-12, 150-15, 430-16, 145-17, 566-

17, 705-17), at Guánica (586-13), at Isabela (147-31).

Homorocoryphus sp.

Wetmore 16-61, 91: eaten by Ani and Mockingbird.

Conocephalus cinereus Thunberg

(as *Neoconocephalus*) Smyth 19-137: on sugar cane.

Wolcott 21-12: in cane fields where other grasses are growing.

Wolcott 24-19: eaten by *Anolis pulchellus*.

AMNH at Arecibo, Coamo Springs and San Juan.

(I No. 902), in tunnel of digger wasp (753-12), on grass (1211-13), in pasture (208-17), on young cane (33-17), at Vega Baja (449-21); at light (564-17), on beans (208-16, 332-17); on rice at Canóvanas (189-16) but more abundant on high grass around fields; on sugar cane at Guánica (312-21).

Conocephalus fasciatus DeGeer

Rehn 10-76: from Vieques Island.

(as *Xiphidion*) Van Z. (P. R. 4).

resting on eggplant at Manatí (I No. 629).

Polyancistrus serrulatus Palisot de Beauvois

Brunner, von Wattenwyl, Carl, "Monographie der Pseudophyllidea" in Der K. K. Zool. Botan. Gesell, in Wien, p. 233, pl. ix, fig. 101, 1895.

Phlugis virens Thunberg

(as *Alogopteron carribbeum*) Rehn, J. A. G., in Ent. News, Vol. 14, p. 141, Philadelphia, 1903: TYPE from P. R.

Gryllacris sp.

on coffee leaves, in spider nest made in curled up leaves, in mountains north of Yauco (383-21, 279-21), all specimens nymphs.

GRYLLIDÆ

Scapteriscus abbreviatus Scudder—det. Chittenden, confirmed A. N. Caudell.

one specimen (188-17).



Scapteriscus vicinus Scudder. One and one-half times natural size. (After Barrett.)

Scapteriscus vicinus Scudder—the "changa".

(as *Gryllotalpa hexadactyla* Perty) Stahl. Gundlach, "Esta especie abunda en Mayagüez y vuela muy frecuentemente a la luz de las casas. Vive en la tierra donde hace daño. Por la

noche, principalmente después de un aguacero fuerte, deja oír un sonido muy monótono, pero suave, producido por la fricción de sus alas; si uno se aproxima, cesa el sonido, pues el insecto percibe la pisada. Para cogerlo es menester aproximarse con sumo cuidado, averiguar donde suena y sacar con un golpe de guataca la tierra con el insecto."

Busck 00-90: "Dr. Stahl---told me it was a comparatively new insect in Porto Rico, having been introduced within his recollection."

Evans, W. H., "Agricultural Investigations in the Island Possessions of the United States." Yearbook, U. S. Dept. Agr. 1901, p. 510: "It is believed that the insect was introduced from South America in guano."

(as *Scapteriscus didactylus* Latr.) Barrett, O. W., "The Changa or Mole Cricket" Bul. 2, P. R. Agr. Expt. Sta. pp. 19, fig. 1, Mayagüez 1902: an extended account, description and figure of adult, life history, natural enemies and methods of control. (as *S. didactylus* Latr.) Rehn 10-76: from Luquillo and El Yunque.

(as *S. d.* Latr.) Van Z. (914) attacking "roots of grasses and of practically all young tender plants."

(as *S. d.* Latr.) Crossman, S. S. & Wolcott, G. N., "Control of the Changa", Circ. 6, Insular Expt. Sta., pp. 3 Río Piedras, 1915: control with Paris Green and flour mixture.

(as *S. didactylus*) Wetmore 16-9: "Bird Enemies of the Mole Cricket". Over half the food of the Cuban Green Heron and over quarter of the food of the P. R. Sparrow Hawk, nearly a sixth of that of the Antillean Killdeer, and a tenth of that of the Spotted Sandpiper is the changa.

Van Zwaluwenburg, R. H., "The Changa or West Indian Mole Cricket". Bul. 23, P. R. Agr. Expt. Station at Mayagüez, pp. 1-27, pl. 3. Washington, D. C., Feb. 12, 1918: an extended account and a complete bibliography.

Cotton 18-270: a pest of vegetables and control. Illustration of adult.

Wolcott 24-6, 16: no parasites known, eaten by *Anolis pulchellus*. EEP-80 to 81: an economic account as a pest of tobacco.

Nolla, J. A. B. "Resultados de la Demostración No. 20 sobre el control de la changa en un semillero de cebollas." Rev. Agr. P. R., Vol. 12, No. 3, p. 202. San Juan, 1924.

Nolla 25-14: injury to onions and means of control.

Bunker, F. H., "El Cultivo del Tabaco en Puerto Rico." Circ. Fomento No. 10, Dept. Agr. y Trab., pp. 73, fig. 20. San Juan, 1926: an extended account of practical methods of changa control (and of other insects), crediting the first use of flour and 4 per cent Paris green to Sr. Luis Sánchez of Comerío.

Danforth 26-22, 32 & 52: abundant in cane fields around Cartagena Lagoon; eaten by Ani, W. I. Green Heron, Pied-billed Grebe and Little Blue Heron.

May 27-5: eaten by *Bufo marinus*.

Earle 28-174: control when attacking sugar-cane.

Thomas, W. A., "The Porto Rican Mole Cricket." U. S. Dept. Agr. Farmers' Bull. No. 1561, pp. 9 fig. 3. Washington, D. C., 1928.

Williams, F. X., "Studies in Tropical Wasps—their Hosts and Associates (with Descriptions of New Species)." Ent. Series Bul. No. 19, Expt. Sta. Hawaiian Sugar Planters' Assn., pp. 179, fig. 16, pl. 34. Honolulu, Hawaii, January 1928: (on p. 45) common at Belem, Pará, Brazil, parasitized by *Larrea americana* Saussure.

Torres 29-24: as a pest of Irish potatoes.

Leonard 31-115; 32-131, 138, 140, 141; 33-116, 128: attacking cotton, grass, sugar-cane, tomatoes, peppers, tobacco and rice.

Dexter 32-4: "constituted only 2.4 per cent of the food of the specimens (of *Bufo marinus*) studied."

Wolcott 32-410: affected by hurricanes.

EEWI-193, 524, 533 to 540: control in cane fields; mamey leaves for controlling the change more valuable than the fruit; an extended economic account as a pest of tobacco and vegetables.

Wolcott 33-265: "generally quite as much of a pest now as it has ever been in the past."

AMC: many records at many points.

adults at light (34-11, 118-11, 329-13, 807-19, 71-19), at Arecibo (13-15), at Condado (64-11), at Guánica (11-10, 546-13, 660-13, 906A-14); attacking rice (622-17); attacking tobacco at Caguas (23-10); attacking sugar cane at Fajardo (20-11), at Arecibo (179-11, 183-11), at Ponce (936-13); attacked by ants (1213-13); attacked by ants, *Pheidole fallax* var. *antillensis* Forel (det. Mann) at Sardinera. Dorado (GNW); attacking tomato at Loíza Aldea (I No. 1615), beans at Arecibo (I No. 3023), peas at Bayamón (I No. 3973).

***Ellipes minuta* Scudder**

(as *Tridactylus histrio* Saussure) Gundlach.

Wetmore 16-39, 57, 89: eaten by Killdeer, Mangrove Cuckoo and Martin.

Wolcott 21-12: "in great abundance in low wet cane field with sandy soil, at Martín Peña and Garrochales."

Wolcott 24-11, 28: eaten by *Ameiva exsul* and *Anolis cristatellus*.

(I No. 3000) very abundant on sandy shore of Laguna del Tortuguero at Algarroba (774-14); at light (15-21) and swept from meadow (438-16); in lima bean field at Vega Baja (I No. 1647) at Loíza Aldea (I No. 3544); in cucumber field at Caguas (I No. 4863); nymphs and adults in enormous numbers in drying-up, but still moist, ditches in cane field at Barceloneta (20-22), along margin of stream at Boquerón (105-23), averaging possibly five or six per sq. in., burrowing in the soil and apparently feeding on very small roots or resting with only head and thorax exposed.

Cycloptilum antillarum Redtenbacher

(as *Liphoplus krugii* Saussure) Gundlach, "de los contornos de Mayagüez".

(I No. 1641), in maga tree at Arecibo (I No. 2415, Leonard 33-137).

Anurogryllus muticus DeGeer

Gundlach. Rehn 10-77: from Culebra Id. and Coamo Springs. Wetmore 16-61, 66, 116, 119: eaten by Ani, Owl, Oriole and Mozambique.

EEWI-541: attacking tobacco and vegetable seed-beds.

Wolcott 24-28: eaten by *Anolis cristatellus*.

at light (179-21, 26-23); in tobacco field at Cayey (360-22).

Gryllodes sigillatus Walker

(as *G. poeyi* Saussure) Rehn 03-135.

Gryllus assimilis Fabr.

Ledru, 1797. (as *G. cubensis* Saussure) Stahl.

(as *G. aztecus* Saussure) Gundlach, "Es especie común y dañina en jardines y huertos. De día está escondido y de noche sale a comer. Emite un sonido fuerte en proporción al tamaño de su cuerpo, incomodando si ha llegado a un dormitorio."

Wetmore 16-22, 61: eaten by Cuban Green Heron and Ani.

Wolcott 24-13: eaten by *Mabouya sloani*.

Nolla 25-15: "tigera"—a pest of onions.

Danforth 31-49: eaten by Antillean Sparrow Hawk.

Dexter 32-6: eaten by *Bufo marinus*.

at light (254-12), at Guánica (327-13, 579-13); in cane-field (37-12); attacking tobacco roots, stems and leaves at Cayey (6-21); attacking beans and cotton, and feeding on fresh cow manure in road at Boquerón (37-23); under dry cow dung at Boquerón (333-23); cutting off carnation flowers and pulling them into its tunnels, observed by F. Seín (15-33).

Anaxipha pulicaria Burmeister

Rehn 03-135.

Cyrtoxipha imitator Scudder

Rehn 03-135.

Cyrtoxipha gundlachi Saussure

Gundlach, "en las cercanías de Mayagüez." Van Z. (P. R. 14).

Smyth 19-137: "on sugar cane, citrus, banana".

abundant on eggplant (14-16): in leaf-sheath of corn (501-17); on grapefruit at Vega Alta (49-17); at light at Mayagüez (264-23).

Hapithus tenuicornis Walker

adults at light at Guánica (579-13).

Orocharis terebrans Saussure, H., *In* "Orthoptera." 1. Biol. Centr. Amer., pp. 277, 1879: TYPE from P. R.

Wetmore 16-58: eaten by Mangrove Cuckoo.
in grapefruit grove at Dorado (I No. 2736).

Orocharis vaginalis Saussure 79-276: TYPE from P. R.

Gundlach, "en las cercanías de Mayagüez".

(as sp.) Wetmore 16-84, 116: eaten by Wood Pewee and Oriole.
Van Z. (P. R. 10). Smyth 19-137: on sugar cane and citrus.
Wolcott 21-49: nymphs and adults feeding on leaves of coffee and grapefruit.

AMC: many records at many points.

at light (41-21, 89-21, 625-21, 73-22, 367-22, 156-23), at Manatí (112-16), in all cases probably attracted from citrus trees; on grapefruit at Pt. Salinas, Plantaje (177-15), at Vega Alta (48-17, 225-17), at Vega Baja (498-17), at Santana (213-16); on coffee, eating leaves along midrib (46-21), at Jájome Alto (370-21), and observed at many points in the coffee districts; on weeds (17-16), at Cayey (321-17), on *Dracaena fragrans* (16-33).

Laurepa (Apithis) krugii Saussure

(as *Aphithis*) Gundlach.

(I No. 899), at Bayamón (181-22); on coffee at Ponce (I No. 3620), at Adjuntas (I No. 4250); on branch of mangrove at Boquerón (180-23).

Diatripus sibilans Saussure, H., "Melanges Orthopterologiques." Fasc. 6, pp. 702-703, 1878: TYPE from P. R.

Phalangopsis guerrina Saussure

Stahl

Paroecanthus sp.—det. A. N. Caudell

at Villalba (I No. 5664).

Amphiacusta carai-bea Saussure

Rehn 10-77: from caves near Pueblo Viejo and San Juan, on El Yunque, and on Culebra and Vieques Ids.

Van Zwaluwenburg 18-26: "A Cricket Attacking Seedlings"—"a household pest of foodstuffs. The damage done to plants is similar to that caused by cutworms and is even mistaken for the work of changas. Flour and Paris green were used successfully in control." Description of eggs.

Cotton 18-270: "sick cricket", a pest of vegetables, "nocturnal in habit, hiding during the day under trash or in cracks in the soil and coming out at night to feed." Control by poison bait for grasshoppers. Illustration of adult.

Wolcott 24-11, 28: eaten by *Ameiva exsul* and *Anolis cristatellus*.

AMC: many records at many points.

in the laboratory (22-15, 66-15, 151-15, 20-16, 227-23);
in the cottages at Pt. Cangrejos (82-16, GNW); (determina-

tions doubtful) in rotten tree trunk at Lares (105-22); in rotten log in mountains north of Yauco (239-22); on the beach at Arecibo under coconut husks (248-22).

Stenogryllus sp.

Wolcott 23-57: on coffee.

One female in hollow in coffee tree at Aibonito (489-21). Antennæ 3 in. long, color generally light purplish-brown, with lavender bloom, eyes reddish-brown, wings and claspers dull yellow, with veination sharply outlined in brown. Many large spines on tibiæ and tarsi of hind legs. Total length $1\frac{1}{2}$ in.

on twig of mangrove at Boquerón (179-23).

ISOPTERA

To Dr. T. E. Snyder, the compiler is greatly indebted for the determination of all specimens of termites, the description of new species, the rearrangement of this list and the adding to it of species recorded in literature not available in Puerto Rico.

- Banks, Nathan,** "Antillean Isoptera." Bulletin of Museum of Comparative Zoology, Vol. 62, No. 10. Cambridge, 1919.
- Wolcott, G. N.,** "Los Comejenes de Puerto Rico." Circ. No. 44, Est. Expt. Insular, pp. 14, fig. 12. San Juan, August 1921.
- Wolcott, G. N.,** "The Comparative Resistance of Woods to the Attack of the Termite, *Cryptotermes brevis* Walker." Bull. No. 33, Insular Expt. Sta., pp. 15, table. San Juan, August 1924.
- Kofoid, C. A.** "Termites and Termite Control." pp. xxv and 734, fig. 182. Univ. Calif. Press. Berkeley, 1934: contains a chapter by T. E. Snyder, "The Termite Fauna of the West Indies and Its Economic Significance", pp. 312-313, besides discussions elsewhere of the experiments of Van Zwaluwenburg, p. 433 and Wolcott, p. 490, in P. R.
- (Editor),
Light, S. F.,
Horner, A. C.,
Randall, Merle,
Hermes, W. B. &
Bowe, Earl E.,

KALOTERMITIDÆ

Kaloterms marginipennis Latreille

Leonard 33-115: in shipment of eggplant.

at light at Bayamón (I No. 3362—December); in pitch pine board, soldiers associated with *C. brevis* adults, nymphs and soldiers (37-25—det. Snyder); in box from Quebradillas (I No. 775).

Kaloterms snyderi Light

Neotermes castaneus Burmeister (as *Caloterms*), TYPE probably from P. R.

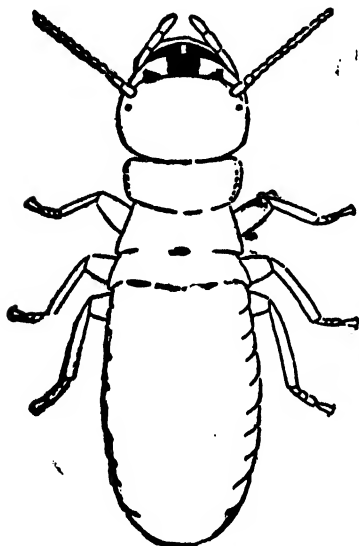
(as *Caloterms*) Stahl. Gundlach, "Vive escondida dentro de las maderas muertas."

Cryptotermes brevis Walker

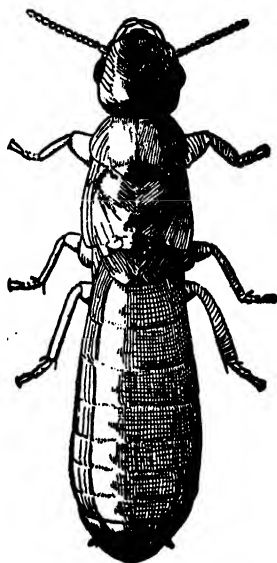
(as *Caloterms*) Gundlach, "Vive como la precedente." Kolbe.

(as *Leucotermes* sp.) Van Zwaluwenburg 16-44: "in woodwork and furniture, hollowing out irregular galleries with the grain

of the wood, and often leaving only a very thin partition to conceal the galleries from the outside. Often the first indication of infestation by this species is the presence of fine granular droppings beneath the wood. Fumigation with hydrocyanic-acid gas" as control.



Cryptotermes brevis Walker,
nymph. Eight times natural
size. (Drawn by G. N.
Wolcott.)



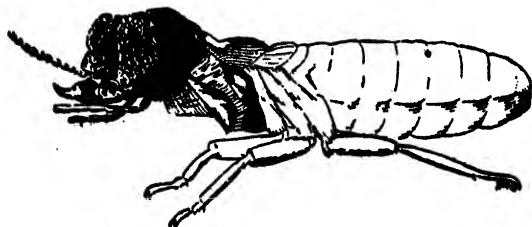
De-alate adult of *Crypto-
termes brevis* Walker.
Six times natural size.
(Drawn by G. N. Wol-
cott.)

Wolcott 21-10: "polilla que destruye los muebles y las casas."

A rather extended account, with illustrations of work, nymph, soldier and dealated adult: life-history and control.

Wolcott 24-4 to 15: an extended economic account.

Wolcott 24-98: summary of Bull. No. 33, which see.



Soldier of *Cryptotermes brevis* Walker. Eight times
natural size. (Drawn by G. N. Wolcott.)

Wolcott 25-54: ability to digest cellulose.

EEP-145 to 149: an economic, illustrated account.

EEWI-11: de-alation of adults, illustration.

in pine wood (184-22), common in houses and furniture, adults emerging on hot, humid nights in May and early June, colonies most active in throwing out "polilla" during the spring; in telephone pole at Cayey (GNW). (as *Kaloterme*) at light at Mayagüez (I No. 2345—det. Snyder).

Glyptotermes corniceps Snyder, T. E. "A New Glyptotermes from Porto Rico." Proc. Ent. Soc. Washington, Vol. 25, No. 4, pp. 91-93, pl. 1. Washington, D. C., April 1923: TYPE from Boquerón, P. R.

one small colony in small tree at Boquerón (81-23 TYPE).

Glyptotermes pubescens Snyder, T. E., "Descriptions of New Species and hitherto Unknown Castes of Termites from America and Hawaii." Proc. U. S. Nat. Museum, Vol. 64 (No. 2496, Art. 6), pp. 40, pl. 5. Washington, D. C., 1924: TYPE (pp. 10-12, pl. 2) from Aibonito, P. R.

one colony in interior of live coffee tree, covered with orchids, and with dead top, at Aibonito (488-21 TYPE).

RHINOTERMITIDÆ

Heterotermes (Leucotermes) convexinotatus Snyder

(as *Leucotermes* sp.) EEP-149: an economic account, written by F. Seín.

in fence at Santurce (79-24); at Naval Radio Station, Puerta de Tierra, main colony in the ground, constructing external tunnels over the concrete foundations up to the wooden timbers of the houses (168-32).

Heterotermes tenuis Hagen

(as *Leucotermes*) Banks 19-481: at Aibonito.

Tenuirostritermes discolor Banks 19-489 (as *Constrictotermes*): TYPE from Culebra Id. and El Yunque, P. R.

(as *Constrictotermes*) Wolcott 21-3: mention.

in rotten stump of *Inga vera* in coffee grove at Ciales (216-22), in dead tree of *Inga vera* at Lares (253-22), no external nest but interior of rotten stump hollowed out and lined with very dark brown termite building material, runways in tree under bark.

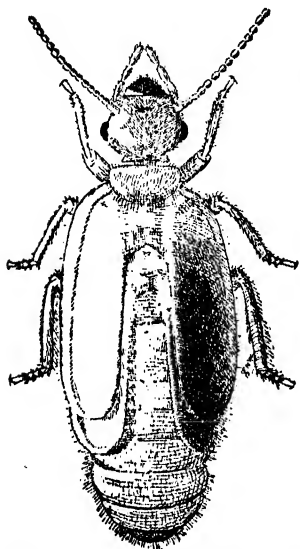
Tenuirostritermes wolcottii Snyder T. E., (as *Nasutitermes* (T.))

"Description of a New Termite from Porto Rico." Proc. Ent. Soc. Washington, Vol. 26, No. 5, pp. 131-132, fig. 1. Washington, D. C., May 1924: TYPE from Boquerón, P. R. "a small, dark species, with a hairy, fairly prominently constricted head."

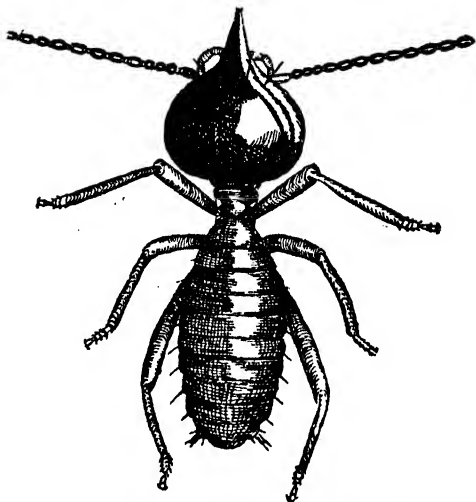
on dead wood of "hucar", *Bucida buceras*, tree at Boquerón (323-23 TYPE), making tunnels an inch or more broad, of soil, with apparently little organic content, over the dead wood, but constructing no nest.

Microcerotermes arboreus Emerson

(as *Eutermes debilis* Heer) Gundlach, after Kolbe. Banks 19-482. Wolcott 21-3: mention.



Nymph of *Nasutitermes costalis* Holmgren. Ten times natural size. (Drawn by G. N. Wolcott.)



Soldier of *Nasutitermes costalis* Holmgren. Twenty times natural size. (Drawn by G. N. Wolcott.)

Nasutitermes costalis Holmgren = *N. morio* Latreille

(as *Termes morio*) Stahl, "comején".

(as *Eutermes morio*) Gundlach, "Muy común y causa mucho daño cuando se ha fijado en habitaciones del campo. Su nido es visible y consiste en una masa pardo-oscuro, dura, alcanzando un gran tamaño." Kolbe.

(as *Eutermes morio*) Van Z. (1710) Van Zwaluwenburg 16-43: note and control "by placing liberal quantities of any powdered arsenical poison in the runways and nest."

Banks 19-486:

Wolcott 21-3: an extended account, with seven illustrations. Wolcott 24-3; persistence in searching for food, control with arsenicals placed on top of nest.

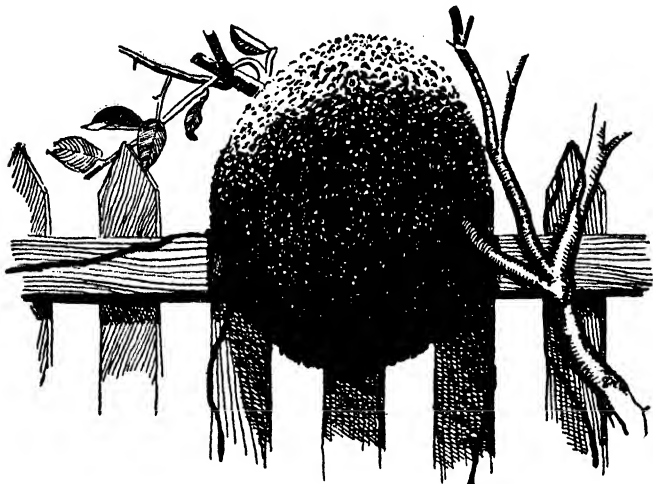
Wolcott 24-33: eaten by *Anolis gundlachi*.

EEP-138 to 145: an economic, illustrated account.

EEW1-3 & 202: the number of termites in a "comejenera" and their abundance in the flamboyant trees between Cayey and Guayama; unimportant as a pest of sugar-cane, control with Paris green.

Randall, Merle & Doody, T. C. (in Kofoid) 34-433: mention of recommendation by Van Zwaluwenburg, and Wolcott, of Paris green for control.

AMC: at Mayagüez, Añasco, Coamo, Aibonito and Río Piedras.



"Nigger-head" nest, or "comejenera" of *Nasutitermes costalis* Holmgren. (Drawn by G. N. Wolcott.)

nest in coconut palm (108-15), on jobo, *Spondias lutea*, tree (178-21), orange tree at Mayagüez (I No. 1058), in mango tree at Ponce (I No. 3231), in shipping crate at Ponce (I No. 1122); alate adults at light June 15 (111-15), at Bayamón in June (I No. 2481), in May (I No. 4207), in December (I No. 3362 Leonard 33-131); adults flying in the rain at 8 A. M., June 10th, dull, cloudy morning at Treasure Island Camp, Cidra, hovering at edge of roof-line and finally coming to rest under the eaves (14-34); four adults, apparently starting a colony in rotten twig of *Bixa orellana* tree at Lares (134-21); one de-alated adult in cavity of dead branch of coffee tree in mountains north of Yauco (178-23).

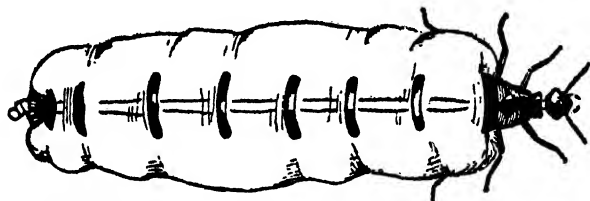
***Nasutitermes creolina* Banks**

Banks 19-484: from Vieques Id. and P. R.

Wolcott 21-3: mention.

nest in algarrobo tree, *Hymenaea courbaril*, (170-21), light brown in color, the outside layers being of uniform brittle

character, the interior layers very hard and tough and containing many hard balls about an inch in diameter with two or more narrow tunnels leading to the interior. The exterior



Ovipositing queen of *Nasutitermes costalis* Holmgren.

Four times natural size. (Drawn by
G. N. Wolcott.)

tunnel to the ground was nearly an inch broad. Only workers, nasuti and immature stages found (July 8). The workers bit viciously.

***Nasutitermes sanchezi* Holmgren**

Banks 19-487:

"Insects Liable to be Introduced into the United States with SOIL from Porto Rico." Notice of Public Hearing, Federal Horticultural Board, U. S. Dept. Agr., Jan. 17, 1922: mention.

***Nasutitermes costaricensis* Holmgren**

Holmgren, "Monograph Amerikanen Eutermes-Arten" Mitth. Naturh. Mus. Hamburg, Vol. 27, (1909) 1910, p. 237:

Banks, Nathan & Snyder, T. E., "Revision of Nearctic Termites" Bull. 108, U. S. National Museum, 1920, p. 82:

***Anoplotermes* sp.**

in earth, around roots of Bougainvillea vine, on Seín's farm, Pueblo Viejo, constructing chambers an inch or more in length and half as high in heavy red clay soil. The colonies (September) contained large numbers of very pale minims, some partly grown nymphs, others larger, with abdomens largely filled (apparently) with earth particles, the largest individuals with yellowish wing-pads having very heavy, elongate abdomens, easily crushed and with a very thin, transparent skin, containing root tissues in the process of digestion (63-33).

EMBIIDINA

Oligotoma cubana Hagen.

Gundlach. Kolbe.

? possibly this species, two specimens at light (1-35).

CORRODENTIA

ATROPIDÆ

Troctes sp. apparently **divinatorius** Müller—det. Dr. Nathan Banks
with dry cacao beans (316-23); scavenger or symbiotic with
Cryptotermes brevis Walker (315-23).

PSOCIDÆ

Caecilius sp.—det. N. Banks

Wolcott 24-25: eaten by *Anolis stratulus*.

under silken shelters on the underside of mealybug-infested
leaves of *Erythrina glauca* (66-23); on drying coffee leaves
from Lares (47-34 det. A. N. Caudell).

Pseudocaecilius pretiosus Banks

(as *P. wolcottii* sp. nov.) Banks, N., Mus. Comp. Zool Bull. Vol.
65, p. 423. Cambridge, 1924. = *pretiosus* Banks, synonymy
by Chapman, P. J., Jour. N. Y. Ent. Soc., Vol. 38, pp. 332-
334, New York, 1930: after study of paratypes.

(as *Psocids*) EEWI-363: scavengers on the under side of palm
fronds.

under silken shelters on the underside of leaves of *Erythrina*
glauca (66-230), of coconut palm (141-23).

Archipsocus brazilianus Enderlein—det. A. N. Caudell

on grapefruit at Garrochales (I No. 5386).

Deipnopsocus sp.—det. A. N. Caudell

on grapefruit at Arecibo (I No. 5371).

Ectopsocus ribagai Enderlein—det. A. N. Caudell

in decayed flower stalk of banana at Bayamón (I No. 2443);
(as sp.) in prunes (I No. 5226, 5228).

Embidipsocus lutens Hagen—det. A. N. Caudell

in cereal (I No. 1268 Leonard 32-143).

Epipsocus sp. nov.—det. A. N. Caudell

at Bayamón (I No. 2976).

Nepticulomima sp.—det. A. N. Caudell
on grapefruit at Palo Seco (I No. 5295).

Polypsocus fasciatus Banks—det. A. N. Caudell
on grapefruit at Bayamón (I No. 5321).

Psoquilla sp.—near *termitorum* Townsend—det. A. N. Caudell
(I No. 2337).

Peripsocus minutus sp. nov. Banks MS
on bean pods of “aroma”, *Acacia farnesiana*, from Boque-
rón (143-23).

Pterodela pedicularia L.—det. N. Banks
among seeds in lettuce plant (10-25).

MALLOPHAGA

Except where noted, all determinations are by Mr. H. S. Peters, and all collections are by Dr. H. L. Van Volkenberg, Parasitologist of the P. R. Agricultural Experiment Station at Mayagüez. To Dr. Emory C. Cushing, the compiler is indebted for these records and for permission to use them in this publication.

BOOPIDÆ

Heterodoxus longitarsus Piaget—det. W. A. Hoffman
on dog at Río Piedras, Feb. 1930 (W. A. Hoffman), at
Mayagüez, det. H. E. Ewing.

GYROPIDÆ

Gyropus ovalis Nitzsch—det. W. A. Hoffman
on guinea pig at San Juan, Nov. 1930, Aug. 1935 (W. A.
Hoffman).

Gliricola porcelli L.—det. W. A. Hoffman
on guinea pig at San Juan Nov. 1930, Aug. 1935 (W. A.
Hoffman).

MENOPONIDÆ

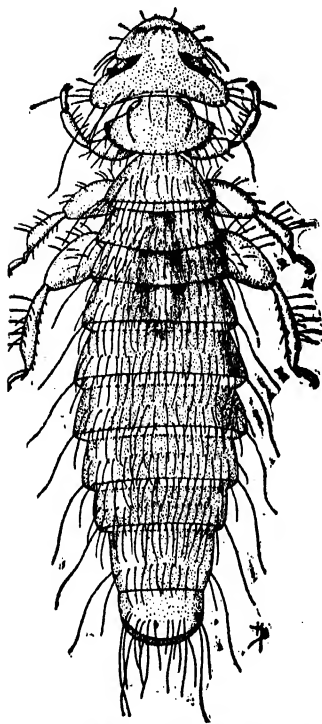
Menopon gallinae L.
(as *M. pallidum* Nitzsch—det. F. C. Bishopp) IP-31: on fowl
(291-23).
on chicken at Mayagüez, April 1932; on turkey at San
Juan (W. A. Hoffman).

Menopon numidiae Giebel—det. W. A. Hoffman
on guinea fowl at Guaynabo, June 1934 (W. A. Hoffman).

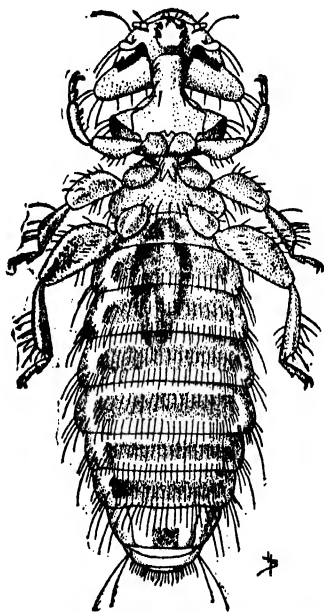
Eomenacanthus stramineus Nitzsch

EEP-155: "piolillo común de las gallinas." Illustration, after Bishopp.

on turkey at Mayagüez, December 1934.



Male of *Eomenacanthus stramineus* Nitzsch. Greatly enlarged. (After Bishopp.)



Female of *Eomenacanthus stramineus* Nitzsch. Greatly enlarged. (After Bishopp.)

Menocanthus sp.

on chicken at San Juan, 1926 (W. A. Hoffman), at Mayagüez.

Colpocephalum sp.

on turkey at Mayagüez, December 1934.

TRICHODECTIDÆ

Bovicola caprae Gurlt

Van Volkenburg 35-24: on cattle.
on goat at Mayagüez, April 1932.

Fellicicola subrostrata Nitzsch

on cat at San Juan (W. A. Hoffman), at Mayagüez, April 1932.

PHILOPTERIDÆ

Goniodes meleagridis L.

on turkey at Río Piedras, October 1931 (W. A. Hoffman),
at Ensenada, December 1934, at Mayagüez, January 1935.

Goniodes dissimilis Nitzsch

on chicken at San Juan, 1926 (W. A. Hoffman), at Mayagüez, April 1932.

Goniocotes hologaster Nitzsch

on chicken at Mayagüez, March 1935.

Lipeurus caponis L.

on chicken at Mayagüez, April 1932.

Lipeurus gallipavonis Goeffroy

on turkey at Río Piedras, October 1931 (W. A. Hoffman),
at Mayagüez, December 1934.

Lipeurus numidiae (Denny) Neumann—det. W. A. Hoffman

on guinea fowl at Guaynabo, June 1934.

ODONATA

To Prof. J. G. Needham, the compiler is greatly indebted for premission to use the records of collections made by him, and by him and Mr. García Díaz, in the spring of 1935, and for identifications of several species new to Puerto Rico.

Klots, E. B., "Insects of Porto Rico and the Virgin Islands—Odonata or Dragon Flies." Scientific Survey of Porto Rico and the Virgin Islands, Vol. 14, pt. 1, pp. 107, ref. 95. New York Academy of Sciences, New York, 1932.

AESCHINIDÆ

Anax junius Drury

Klots 32-17: nymph from P. R.

García Díaz: at La Muda, Almirante Rd. at K. 6.7, Lares, L. Tortuguero, Río Piedras, Cabo Rojo, Yunes R., Florida, Caño Tiburones.

Anax amazili Burmeister

Klots 32-17: nymph from P. R.

Aeshna cornigera Brauer

Klots 32-18: at Adjuntas.

Coryphaeschna adnexa Hagen

Klots 32-20: at Río Piedras.

Needham: at La Muda, Florida Road, L. Tortuguero.

Acanthagyna nervosa Rambur

(as *Gynacantha*) Kolbe 88-168. Gundlach. IP-34.

Klots 32-23.

Gynacantha trifida Rambur

Stahl. Gundlach. IP-34. Klots 32-24.

LIBELLULIDÆ

Orthemis ferruginea F.

(as *O. discolor* Burmeister) Stahl. Kolbe 88-168. Gundlach. IP-34.

IPSup-38.

Klots 32-28: at Aibonito, Adjuntas, Cayey, Barros, Arecibo, Juana Díaz, Lake Tortuguera, Fajardo (Las Cabezas), and Pueblo Viejo-Cataño. Nymphs from Coamo Springs Reservoir.

Needham and García Díaz: Cartagena Lagoon, Cabo Rojo, Yunes R., Florida, Río Blanco.

Perithemis domitia Drury

(as *Libellula metalla* Selys) Stahl.

Gundlach. IP. Klots 32-28: nymphs and adults at Río Piedras.

Needham and García Díaz: Cabo Rojo, Sink beside Road No. 2 at Km. 103.

Miathyria marcella Selys

Klots 32-34: at Manatí, nymph at Coamo Springs.

Needham and García Díaz: Cartagena Lagoon, Cabo Rojo, Caño Tiburones.

Micrathyria didyma didyma Selys

(as *Dythemis dicrora* Hagen) Kolbe 88-168. Gundlach. IP. IPSup: without sub-species.

Klots 32-38.

Micrathyria dissocians Calvert, P. R., TYPE From Mayagüez, P. R., "Odonata" in Biología Centrali-Americana. Neuroptera. pp. 17-420, pl. 9. London, 1901-08. (see pp. 222-6.)

Klots 32-39: at Manatí, Caguas, Río Piedras: nymphs from Coamo Spgs.

Needham and García Díaz: Cartagena Lagoon, Caño Tiburones, Isabela.

Micrathyria aequalis Hagen—det. J. G. Needham

Needham and García Díaz: Cabo Rojo.

Micrathyria hageni Kirby

Kolbe. Klots 32-41.

Erythrodiplax umbrata L.

(as *Libellula*) Stahl. Gundlach. Kolbe 88-167. IP.

IPSup. Klots 32-43: records by Calvert (1906) and Ris.

Needham and García Díaz: Río Piedras, La Muda, L. Tortuguero, Caguas, Cartagena Lagoon, Guánica L., Cabo Rojo, Yunes R., Florida, Utuado, Caño Tiburones, Palo Seco, Lares, Isabela, Río Blanco.

Erythrodiplax minuscula Rambur

(as *Diplax portoricana*) Kolbe 88-168: TYPE from P. R.

(as *Diplax portoricensis* Kolbe) Gundlach. IP.

(as *Erythrodiplax portoricana* Kolbe) IPSup.

Klots 32-45.

Erythrodiplax berenice naeva Hagen

Klots 32-46: at Santurce and San Juan.

Erythrodiplax connata justiniana Selys

(as *Diplax ambusta* Hagen) Kolbe 88-168. Gundlach. IP.

Klots 32-48: record by Hagen, 1875; at Martín Peña, Aibonito, Coamo Springs, Barros, Adjuntas, Caguas, Guayanilla, San Juan and Río Piedras.

Needham and García Díaz: Coguitas R., Almirante Road, Caño Tiburones, Arecibo R., Isabela.
(9-17) det. Rolla P. Currie.

Brachymesia furcata Hagen—det. J. G. Needham
J. G. Needham: one male at Coamo Springs, April 5, 1930.

Brachymesia herbida Gundlach.
Klots 32-51: at Toa Baja, Arecibo, flying to lights in train, northern coast, at Desengaño.
Needham and García Díaz: L. Tortuguero, Río Piedras, Cartagena Lagoon, Yunes R., Isabela.

Erythemis plebeja Burmeister
Klots 32-54: at Ponce and Arecibo.

Lepthemis vesiculosa F.
Kolbe 88-168. Gundlach. IP.
Root 22-405: capturing a deer fly, *Chrysops costatus* F. at Aguirre.
Klots 32-56: at Ponce, Mayagüez, Coamo Springs, Caguas, Santurce, Río Piedras, flying to lights in train, northern coast, and at Fajardo (Las Cabezas). Nymphs at Coamo, and Coamo Springs (Needham), reared to adults at Río Piedras by Julio García Díaz.
Needham and García Díaz: L. Tortuguero, La Muda, Cartagena Lagoon, Cabo Rojo, Guánica L., Yunes R., Florida, Río Blanco, Almirante Rd., Caño Tiburones, Isabela.
abundant in swampy field near woods at Aibonito (573-16, det. Rolla P. Currie).

Macrothemis celeno Selys
(as *Dythemis pleurostictia* Hagen) Stahl.
Kolbe 88-168. Gundlach. IP. Klots 32-59: at Ensenada, Tallaboa, Adjuntas, Barros, Aibonito, Coamo Springs, Juana Díaz, Cayey, Caguas and Mameyes. Nymphs from Coamo Springs and Las Cruces.
Needham and García Díaz: La Muda, Cagüitas L., Río Blanco, Tanama R., Lares, Lotic waters.

Dythemis rufinervis Burmeister
Stahl. Kolbe 88-168. Gundlach. IP. Klots 32-62: at Aibonito, Coamo Springs, Cayey, San Juan, Río Piedras and Mameyes. Nymphs from Las Cruces and Coamo Springs.
Needham and García Díaz: L. Tortuguero, La Muda, Cartagena Lagoon, Río Blanco, Almirante Rd., Arecibo R.

Scapanea frontalis Burmeister
IP Sup. Klots 32-65: at Mayagüez, Adjuntas, Aibonito, Caguas and Cayey.
Needham and García Díaz: Luquillo Mts., Río Blanco, Arecibo R., Guajataca R. at Lares.

Tramea abdominalis Rambur

Kolbe 88-167. Gundlach. IP. Klots 32-69: at Desengaño, Ensenada, Aibonito, Coamo Springs, Manatí and San Juan. Needham and García Díaz: Río Piedras, L. Tortuguero, Cartagena Lagoon, Cabo Rojo, Florida, Río Blanco, Almirante Rd., Caño Tiburones, Isabela.

Tramea onusta Hagen—det. J. G. Needham

Needham and García Díaz: Río Piedras, L. Tortuguero, Cartagena Lagoon.

Tramea binotata Rambur

Klots 32-70: at Manatí (det. F. Ris).
Needham and García Díaz: Almirante Rd., Arecibo R., Caño Tiburones.

Pantala flavescens F.

Gundlach. IP. Klots 32-73.
Needham and García Díaz: L. Tortuguero.

Ephidatia cubensis Scudder—det. J. G. Needham

Needham and García Díaz: Lake Tortuguero.

COENAGRIONIDÆ

Lestes forficula Rambur

Klots 32-77: at Desengaño, Quebradillas, Tortuguero Lake, Manatí. Martín Peña and Río Piedras.
Needham and García Díaz: Cartagena Lagoon, Almirante Rd., Isabela.

Lestes spumarius Selys

(as *L. spumaria* Hagen) Kolbe 88-172. Gundlach. IP.
Klots 32-78: record by Selys: at Arecibo.
Needham and García Díaz: Almirante Rd.

Lestes scalaris Gundlach

Klots 32-79: records by Calvert, 1909 and 1919.

Protoneura capillaris Rambur

Klots 32-81: record by Selys, 1886.

Telebasis dominicanum Selys

(as *Erythrargrion*) Kolbe 88-165. Gundlach. IP.
IP Sup. Klots 32-84: at Adjuntas, Caguas and Río Piedras.
Nymphs from Las Cruces and Coamo Springs.
Needham and García Díaz: Río Piedras, Cagüitas Cr., Almirante Rd., Arecibo R.

Telebasis vulnerata Hagen

(as *Erythrargrion*) Kolbe 88-165. Gundlach. IP.
IP Sup. Klots 32-86: record by Hagen; at Mayagüez, Jayuya, Adjuntas, Barros, Aibonito, Coamo Springs, Cayey and San Juan.
Needham and García Díaz: Río Blanco.

Leptobasis vacillans Selys

Kolbe 88-172. Gundlach. Klots 32-87.

Ceratura capreola Hagen

Klots 32-89: record by Hagen, 1861.

Needham and García Díaz: L. Tortuguero, ditch near Arecibo R.

Ischnura ramburii Selys

Kolbe 88-170. Gundlach. IP. Klots 32-93: at Mayagüez, Arecibo, Coamo Springs, Caguas, Río Piedras, Martín Peña, San Juan, Lake Tortuguero. Swamp at west end and at Fajardo (Las Cabezas).

Needham and García Díaz: La Muda, Cartagena Lagoon, Cagüitas R., Almirante Rd., Caño Tiburones, Isabela.

Enallagma coecum Hagen

Kolbe 88-165. Gundlach. IP. Klots 32-96: record by Selys, 1876; at Ensenada, Adjuntas, Jayuya, Barros, Aibonito, Coamo Springs, Cayey, Cidra, Caguas and Mameyes. *E. Krugii* Kolbe in synonymy.

Needham and García Díaz: Río Piedras, Cabo Rojo, Yunes R., Florida, Cagüitas R., Río Blanco, Lares.

Enallagma cardenium Selys—det. J. G. Needham

Needham & García Díaz: Lake Tortuguero, Feb. 10 & 15, 1935.

Enallagma civile Hagen

Kolbe 88-170. Gundlach. IP. Klots 32-98: at Lake Tortuguero, Manatí, Aibonito, Coamo Springs and Caguas.

Needham and García Díaz: Río Piedras, Cartagena Lagoon, Florida, Almirante Rd., Isabela.

Anomalagrion hastatum Say

Klots 32-99: record by Calvert, 1909; at Mayagüez and San Juan.

Needham and García Díaz: Río Piedras, Lake Tortuguero, Cartagena Lagoon, Guánica L., Cabo Rojo, Utuado, Florida, Almirante Rd., Caño Tiburones.

Argiallagma minutum Selys—det. J. G. Needham

Needham & García Díaz: Lake Tortuguero, Feb. 15 & 20, at Almirante Road, Km. 6.7, March 9, 1935.

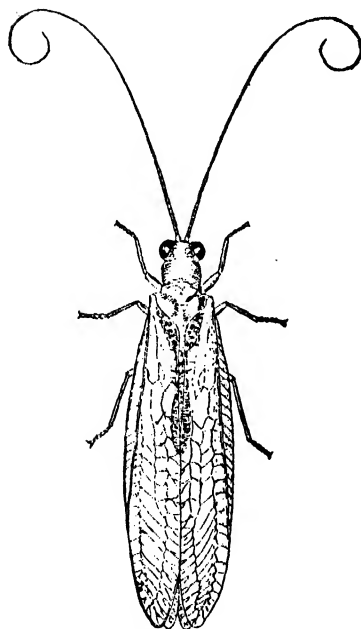
NEUROPTERA

Kolbe, H. J.,

"Neuroptera v. d. Sammlung von Herr Krug." Archiv. für Naturgeschichte, 46th year, Vol. 1, No. 2, pp. 153-178, pl. 13, fig. 11, 1888.

Smith, Roger C.,

"The Neuroptera of Haiti. West Indies." Annals Ent. Soc. America, Vol. 24, No. 4, pp. 798-823, pl. 2, ref. 11. Columbus, Ohio, December 1931; no P. R. records.



A *Chrysopa* from Haiti. Three times natural size. (Drawn by F. Maximilien.)

CHRYSOPIDÆ

Dr. Nathan Banks made the determinations in this family of specimens in the collection of the College of Agriculture at Mayagüez (AMC).

Chrysopa antillana Nevas—det. N. Banks

AMC: at Mayagüez ix-30, ii-34.

Chrysopa collaris Schneider

Gundlach. Kolbe.

Jones 14-462: predaceous on *Sipha flava* Forbes on sugar-cane.
EEP-38: same data.

Wolcott 24-25, 28: pupa eaten by *Anolis stratulus*, adult by *Anolis cristatellus*.

Leonard 32-1106: predaceous on Cottony Cushion Scale.

Wolcott & Sein 33-213: quoting Leonard.

AMC: at Algarrobo iv-30, Joyuda xi-30, Mayagüez xii-30, i-30,
all det. Dr. Nathan Banks.

(672-12, 239-16), adults on cane infected with the aphid, *Sipha flava* Forbes (652-12, 785-12), at Villalba (78-24), reared from egg, using this aphid for food (709-12), from leaves of *Erythrina* infested with mealybugs, *Pseudococcus nipae* Mask. (155-13, 89-23); adults abundant on *Amaranthus* at Cayey (128-16); all stages abundant on grapefruit trees at Vega Baja (490-16) "larvæ feed on eggs of *Diaprepes spengleri* Linn., also on plant lice and nymphs of *Ormenis* spp." R. T. Cotton; on trunks or foliage of grapefruit at Vega Alta (114-17, 147-17, 214-17); on coffee trees at Co-rozal (282-21) and occasionally noted in coffee groves in other districts; larvæ feeding on *Ceroplastes* sp. scales on *Psidium guajava* (275-13).

Chrysopa cubana Hagen—det. N. Banks

AMC: at Añasco ix-30, Guayama i-30, Sabana Llana xii-30, Yabucoa vi-30, Río Piedras i-29.

Chrysopa damiensis Smith—det. N. Banks

AMC: Luquillo vii-32, Río Piedras xii-30, Salinas xii-33, Coamo Springs xi-29, Mayagüez iv-30, xi-31.

Chrysopa externa Hagen

Kolbe 88-173. Gundlach.

Chrysopa exterior Navas—det. N. Banks

AMC: at Mayagüez vii-31, ix-30, vii-31.

Chrysopa haitiensis Smith—det. N. Banks

AMC: at Río Piedras i-32.

Chrysopa krugii Kolbe 88-173: TYPE from P. R.

Gundlach.

Chrysopa thoracica Walker

Gundlach. Kolbe.

AMC: at many localities, det. N. Banks

Protochrysopa insularis Walker

Gundlach. Kolbe.

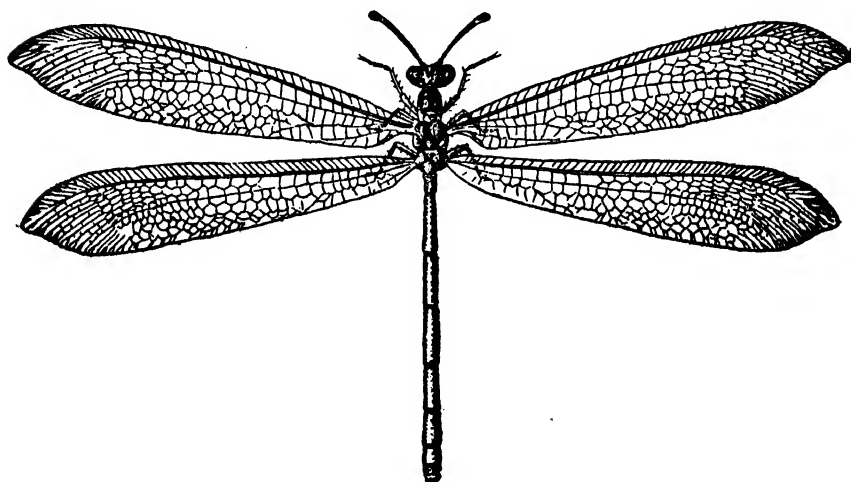
MYRMELEONIDÆ

Acanthaclisis fallax Ramb.
Gundlach.

Myrmeleon insertus Hagen

Kolbe 88-174. Stahl. Gundlach, "común".

(? this sp.) larvæ abundant in sandy soil at Guánica (160-13), adult at light (2-34 det. GNW from Smith).



Myrmeleon insertus Hagen. Twice natural size.
(Drawn by F. Maximilien.)

Ascalaphus hyalinus Latereille
(as *Uhula*) Kolbe 88-174.
Gundlach.

TRICHOPTERA

PHRYGANEIDÆ

Setodes candida Hagen
Gundlach. Kolbe.

Chimarra albomaculata Kolbe 88-175, TYPE from P. R.
Gundlach.

adults common at light at Mameyes (197-13 det. N. Banks).

THYSANOPTERA

- Hood, J. D.,** "Two New Thysanoptera from Porto Rico." *Insecutor Inscitiæ Menstruus*, Vol. 1, No. 6, pp. 65-70, pl. 1. Washington, June 1913.
- Hood, J. D.,** "On a Collection of Thysanoptera from Porto Rico." *Insecutor Inscitiæ Menstruus*, Vol. 1, No. 12, pp. 149-154. Washington, December 1913.
- Hood, J. D.,** "Two Porto Rican Thysanoptera from Sugar Cana." *Insecutor Inscitiæ Menstruus*, Vol. 2, No. 3, pp. 38-41. Washington, March 1914.
- Watson, J. R.,** "Synopsis and Catalog of the Thysanoptera of North America." Technical Bull. No. 168, Agr. Expt. Sta. Univ. Florida, pp. 100. Gainesville, December 1923.
- Morgan, A. C.,** "A New Genus, a New Subgenus and Seven New Species of Thysanoptera from Puerto Rico." *Florida Entomologist*, Vol. 9, No. 1, pp. 9. Gainesville, 1925.
- Dozier, H. L.,** "Notes on Porto Rican Thysanoptera." *Jour. Dept. Agr. P. R.*, Vol. 10, Nos. 3 & 4, pp. 279-281, fig. 1. San Juan, September 1927.
- Leonard, M. D.,** "Thrips Injurious to Citrus and Roses in Puerto Rico." *Jour. Ec. Ent.*, Vol. 25, No. 4, pp. 934-935. Geneva, N. Y., August 1932.
- Cercyothrips striatus** Morgan 25-1: TYPE from Río Piedras, P. R. IPSup-42: collected by E. G. Smyth on climbing bush (685-19).
- Franklinothrips vespiformis** Crawford
 Dozier 26-122: on guava.
 Dozier 27-279: on guava and rose flowers.
 on guava leaves (93-24 det. J. R. Watson); in lima bean flowers at Isabela 163-31 det. J. R. Watson); on bean leaves (78-20 det. E. G. Smyth); or sweet potato leaves (82-20 det. E. G. Smyth).
- Heterothrips borinquen** Hood, J. D., "Description of New American Thysanoptera." *Insecutor Inscitiæ Menstruus*, Vol. 3, Nos. 1-4, p. 1. Washington, D. C., January-April 1915: TYPE from Porto Rico, "in blossoms of undetermined plant."
 Watson 23-29:

Heterothrips sericatus Hood 13-66: TYPE from Río Piedras, P. R.
Van Z. Watson 23-29:

common in blossoms of guava (507-12 TYPE); at Barce-
loneta (I No. 2489 Leonard 33-117).

Corynothrips stenopterus Williams—det. A. C. Morgan
IPSup-42: on yuca, *Manihot utilisima*, (788A-19).

Limnothrips cerealium Haliday—det. A. C. Morgan
IPSup-42: on leaves of sugar-cane at Guánica, March 18, 1920
(GNW).

Sericothrips portoricensis Morgan 25-3: TYPE from Río Pie-
dras, P. R.
(as sp.) IPSup-42: two females collected by E. G. Smyth,
March 25, 1920.

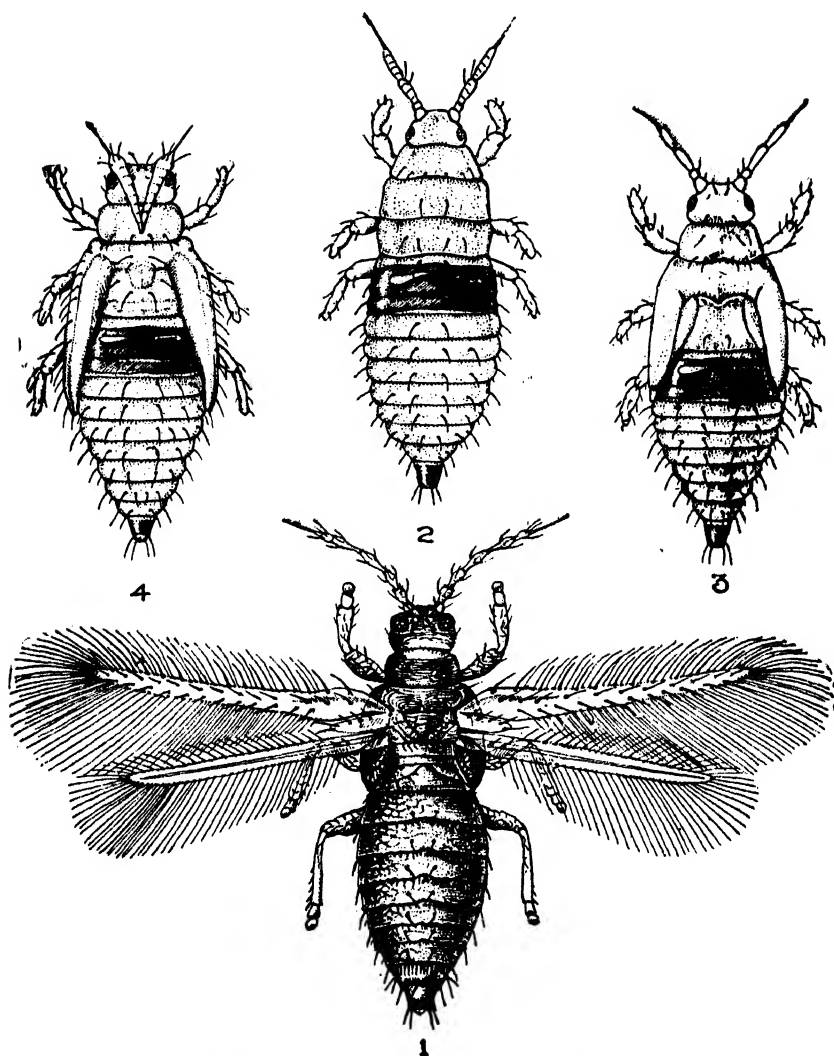
Heliothrips fasciatus Pergande—det. A. C. Morgan
IPSup-42: on alfalfa (349-23), collected by F. Seín.

Heliothrips femoralis Reuter
(as *Haplothrips*) Hood 14-38. Van Z. Jones 14-463: on
sugar-cane.
Watson 23-35: generic transfer.
on sugar-cane (8-14).

Heliothrips haemorrhoidalis Bouché
Hood 13-149. Van Z. Dozier 27-280: on *Barringtonia speciosa*.
EEWI-448: on citrus.
on orange leaves at La Muda (68-20 det. E. G. Smyth); on
coconut palm (GBM).

Selenothrips rubrocinctus Giard—det. H. M. Russell
Hood 13-149. Van Z.
EEP-112: an economic account. EEP-73: on mango.
Dozier 26-122: on grape, achiote, mango, almendra and guava.
Dozier 27-279: on muscadine grape, mango, guava, almendra,
mangosteen, Burbank Thornless Blackberry, Himalaya Rasp-
berry and Cuthbert Raspberry.
Leonard 33-118: on mango.
on leaves of jobo, *Spondias lutea* (687-12 det. H. M. Russell,
721-16), of *Acalypha wilkesiana* (34-20), very injurious to
young leaves of mango (GNW); on okra at Ponce (I No.
3133); on icaco at Trujillo Alto (I No. 4279); on guava
at Mayagüez (129-32); on almendra, *Terminalia catappa*,
(I No. 2488), at Bayamón (I No. 5264); on cashew (I No.
2159); on muscadine grape (80-24).

Frankliniella cephalica Crawford, var. *melanommata* Williams—det.
J. R. Watson
on flowers of *Bidens pilosa* at Arecibo (108-32).



Selenothrips rubrocinctus Giard: adult, larva, pre-pupa and pupa.
Greatly enlarged. (After Russell.)

Frankliniella citripes Hood—det. J. R. Watson
on flowers of *Citrus medica* at Las Marías (I No. 1081).

Frankliniella cubensis Hood—det. J. R. Watson
Leonard 32-934: in flowers of citrus.
on leaves of yuca, *Manihot utilissima* (42-33); in Hibiscus
flowers at Mayagüez (I No. 2111 Leonard 33-117); in flowers
of *Bidens pilosa* (I No. 2491); in flowers of crotalaria at Are-
cibo (I No. 3639).

Frankliniella difficilis Hood—det. J. R. Watson
Leonard 32-934: in flowers of citrus.
in flowers of grapefruit at Palo Seco (I No. 2130), at Vega
Alta (I No. 2215), of Hibiscus at Ponce (Oakley).

Frankliniella insularis Franklin
Hood 13-149: Van Z. Watson 23-40:
Wetmore 16-72; eaten by Green Mango, *Anthracothonax vi-*
ridis.
Dozier 27-280: "the most common species of flowers thrips"—
in flowers of rose, wild sword bean and granadilla.
Leonard 32-934: in flowers of citrus and rose.
Leonard 33-125: a serious pest of roses at Mayagüez and on
Vieques Id., also on cannas.
in flowers of "roble", *Tecoma pentaphylla* (265-12 det.
Russell); in flowers of sword bean (IILD.), of lima bean at Isa-
bela (162-31 det. Watson), at Bayamón (I No. 1116, at Loíza
(I No. 1720); in flowers of *Citrus medica* at Las Marías (I No.
1081); in flowers of pigeon peas at Mayagüez (I No. 1288 Leo-
nard 32-136), at Ponce (I No. 1742); in flowers of Hibiscus at
Mayagüez (I No. 2111, 2390 Leonard 33-117); in flowers of
grapefruit at Palo Seco (I No. 2130), at Vega Alta (I No. 2215),
at Mayagüez (I No. 2387); in flowers of cereza, *Malpighia*
punicifolia, at Aguadilla (I No. 2336); in flowers of *Bidens*
pilosa (I No. 2491); in flowers of citron at Adjuntas (I No.
3197); in flowers of crotalaria at Arecibo (I No. 3639); in
flowers of broccoli at Villalba (I No. 5176).

Frankliniella tritici Fitch—det. J. D. Hood
Watson 23-39: "(Probably *cephalica*)", questioning Hood's
record.
Dozier 27-280: in flowers of grapefruit at Trujillo Alto, det.
J. D. Hood.

Frankliniella williamsi Hood—det. A. C. Morgan
(as sp.) Smyth 19-138: the yellow cane thrips.
(as "yellow thrips of cane") Wolcott 21-13: abundant inside
the central whorl of leaves during extended droughts.
EEWI-242: the above data.
on sugar-cane at Guánica (140-21, 8-221), at Barceloneta
(7-22).

Thrips abdominalis Crawford—det. J. R. Watson
in flowers of *Bidens pilosa* (I No. 2491).

Thrips tabaci Lindemann—det. H. M. Russell
Jones 15-2: as a pest of onions.
Cotton 18-303: very destructive to onions.
Nolla 25-16: control.
EEP-122: an economic account.
Leonard 31-118 & 32-134: on onions.
on onions (508-12); on *Solanum torvum* (63-17 det. E. G. Smyth); especially destructive to onions in 1935 as many inexperienced farmers were induced to grow onions by the Puerto Rico Emergency Relief Administration.

Anaphothrips bicolor Morgan 25-4: TYPE from Bayamón, P. R.
(as sp.) IPSup-42: four females from leaves of sugar-cane, May 25, 1920 (GNW).

Dinurothrips hookeri Hood 13-149: TYPE from P. R.
Van Z. Watson 23-47: quoting Hood, "on *Ipomoea*."
at Río Piedras, March 25, 1920 (EGS).

Hoplandothrips reynei Priesner
Dozier 27-281: on *Cassia fistula*, "probably predaceous".

Liophloeothrips portoricensis Watson MS
associated with citrus mealybug and scale on grass at Río Piedras, December 1924 (H. L. Dozier).

Lissothrips (Prolissothrips) stratulus Morgan 25-5: TYPE from El Yunque, P. R.
(as sp.) IPSup-43: from stomach of lizard, *Anolis stratulus* Cope, collected May 9, 1924 at Hda. Santa Catalina, Mameyes, by F. Seín.

Hindsiana cocois Watson—det. A. C. Morgan
IPSup-43: on leaves of sugar-cane at Camuy, April 26, 1920 (GNW).

Hindsiana weigeli Watson—det. A. C. Morgan
IPSup-43: (probably from sugar-cane) at Río Piedras, Feb. 23, 1920 (GNW).

Haplothrips gowdeyi Franklin
Hood 13-149. Van Z. Watson 23-60: quoting Hood.
on almendra, *Terminalia catappa* (I No. 2488 Leonard 33-129); on flowers of *Bidens pilosa* (I No. 2491); on *Dianthus* (P.Q.C.A. Philadelphia No. 19467; on tuberose (P.Q.C.A. Philadelphia No. 19650).

Haplothrips merrilli Watson ?—det. J. D. Hood
Dozier 27-280: from scale insect or white fly material, probably predaceous.

Haplothrips tibialis Hood 14-38: TYPE from P. R.

Jones 14-463: on sugar-cane.

Smyth 19-138: the black cane thrips.

(as "black thrips") Wolcott 21-13: note.

on sugar-cane (8-14 TYPE, 17-14), at Guánica (141-21), not abundant.

Podothrips semiflavus Hood 13-68: TYPE from P. R.

Van Z.

Smyth 19-138: on sugar-cane and Para (malojillo) grass.

Watson 23-62:

on malojillo grass, *Panicum barbinode*, at Guánica (227-12 det. H. M. Russell).

Aleurodothrips fasciapennis Franklin

Dozier 27-279: from citrus infested with soft and purple scale.

on citrus leaf (PQCA New York No. 20717 det. J. R. Watson).

Gastrothrips fuscicauda Morgan 25-6: TYPE from Río Piedras, P. R.

(as sp.) IPSup-42: in stomach of lizard, *Anolis cristatellus* D. & B., Oct. 3, 1923 (308-23).

Gastrothrips anolis Morgan 25-7: TYPE from Río Piedras, P. R.

(as sp.) IPSup-42: in stomach of lizard, *Anolis cristatellus* D. & B., Oct. 3, 1923 (308-23).

Diceratothrips wolcottii Morgan 25-8: TYPE from Cayey and Pt. Cangrejos, P. R.

(as sp.) IPSup-43: in rotten cotton boll injured by Pink Bollworm at Pt. Cangrejos (307-23), one large black adult and many nymphs with bright red thorax and abdomen, their legs, prothoracic plate and terminal segment black; on leaves of *Inga vera* at Cayey (306-23).

Ommatothrips gossypii Hood—det. A. C. Morgan

on coffee leaves (GNW); on leaves of *Inga vera* at Cayey (306-23).

Gynaikothrips uzeli Zimmerman

(as *Mesothrips ficorum* Marchal = *Liothrips bakeri* Crawford)

Russell, H. M., "The Red-Banded Thrips." U. S. Dept. Agr. Bureau of Entomology, Bull. No. 99, pt. II, pp. 17-29. Washington, 1912: footnote on p. 17, on *Ficus* in Porto Rico. Hood 13-65. Van Z.

Dozier 27-280: on *Ficus nitida*.

Leonard 32-142 & 33-130: on *Ficus nitida*.

on leaves of *Ficus nitida* (18-12 det. H. M. Russell), common on this host in plazas of San Juan (I No. 2021), Río Piedras, Caguas (I No. 2168), Manatí, Guayama.

ANOPLURA

PEDICULIDÆ

Pediculus humanus humanus L.—det. H. E. Ewing
(as *P. capitis* DeGeer) AMC: at Mayagüez xi-30.
on man at Mayagüez (H. L. Van Volkenberg)

Phthirus pubis L.—det. H. E. Ewing
on man at Mayagüez (H. L. Van Volkenberg)

HAEMATOPINIDÆ

Haematopinus eurysternus Nitzsch—det. H. E. Ewing
Van Volkenberg 34-24: occasionally, heavy infestations on the
body or eyelids on native cattle.

Haematopinus adventicius—det. H. E. Ewing
Van Volkenberg 35-24: "occasionally, confined pigs become
heavily infested."

Haematopinus tuberculatus Burmeister—det. H. E. Ewing
Van Volkenberg 34-24: very common in the switch of the tail
of cattle of the south coast.
Van Volkenberg 35-24: common on livestock.

Linognathus africanus Kellogg & Paine—det. H. E. Ewing
Van Volkenberg 35-24: on goats.

HOMOPTERA

No one person has made determinations in this order as a whole, but of the families, Dr. W. D. Funkhouser has determined the Membracidae, Mr. F. Muir of the Experiment Station of the Hawaiian S. P. A., the Fulgoridae, and in the Jassidae (Cicadellidae) Dr. E. D. Ball and Prof. Z. P. Metcalf made some of the determinations, while more recently Prof. D. L. DeLong has redetermined and described a considerable number of species. Dr. A. L. Quaintance, with Dr. A. C. Baker, has determined the Aleyrodidae, and altho they have published descriptions of a number of new species from Porto Rico, the descriptions of several others are still in manuscript. The earliest authoritative determinations of the Aphididae were by Mr. J. J. Davis, later determinations have been made by Mr. H. F. Wilson, Dr. Edith M. Patch and Dr. A. C. Baker. Mr. E. R. Sasser and Mr. E. W. Rust determined all the earlier collections of Coccidae, but Dr. Harold Morrison and Prof. G. F. Ferris have made the more recent determinations and both have described one (the same) new species from Porto Rico.

Most of the determinations of scale insects recorded under Interception Numbers (I No.) were made by Dr. Harold Morrison, or by Mr. E. R. Sasser, altho many of the common species were determined by various persons in the office of the latter. Mr. G. B. Merrill determined the Aleyrodidae, Dr. P. W. Mason the Aphididae and Dr. P. W. Oman the other families of which specimens are recorded under Interception Numbers.

The American Museum of Natural History most graciously loaned the cuts illustrating Dr. Dozier's papers for reproduction in this section, and the New York Academy of Sciences, at the request of Dr. Osborn, those in his most recent paper.

Osborn, Herbert,
29-81 to 112.

"Notes on Porto Rican Homoptera." Jour. Dept. Agr. P. R., Vol. 13, No. 3, pp. 81-112, ref. 13, map. San Juan, November 1929.

Dozier, H. L.,
31-1 to 24.

"New and Interesting West Indian Homoptera." Amer. Mus. Novitates No. 510, pp. 24, fig. 18. New York, Dec. 15, 1931.

Osborn, Herbert,
35-111 to 260.

"Insects of Porto Rico and the Virgin Islands Homoptera (excepting the Sternorhynchi)." Scientific Survey of Porto Rico

and the Virgin Islands, New York Academy of Sciences, Vol. 14, pt. 2, pp. 111-260. fig. 71, ref. 48. New York, 1935.

CICADIDÆ

Boreconea aguadilla Davis, Wm. T., "The Cicadas of Porto Rico with a Description of a New Genus and Species." Jour. N. Y. Ent. Soc., Vol. 36, pp. 29-34, fig. 2, pl. 1. New York, March 1928: TYPE from Yauco, others from Mayagüez, Aibonito and Lares, P. R., "brownish color, pepper and salt appearance—sides of pronotum expanded—medially angulated into sharp points."

(as *Proarno* sp.) Wetmore 16-77, 82: eaten by Kingbird and Flycatcher.

(as *Zammara* sp.—det. W. L. McAtee) IP-256: at light at Aibonito (1305-13); on coffee tree at Lares (481-21), at Corozal (279-21), in mountains north of Yauco (247-22 TYPE); nymphs from soil about roots of coffee trees at Añasco (375-12), of other trees (374-12).

Osborn 29-90 and 35-121:

AMC: at Río Piedras i-28, Villalba ii-30, Aguadilla xii-32, Mayagüez vii-32, ix-30, xi-29.

Proarna hilaris Germar

(as *Odopoea* sp.) Van Z. (P. R. 719).

Wetmore 16-57, 59, 63, 69, 77, 80, 82, 96, 98, 106, 114, 116, 119: eaten by Mangrove Cuckoo, Ground Cuckoo (4.16% of food), Woodpecker, Owl, Petchary (2.47% of food), Flycatcher, Kingbird, Vireos, Yellow Warbler, Yellow-Shouldered Blackbird, Oriole and Mozambique.

Davis 28-30: det. by W. E. China as *hilaris* ?, specimens examined from San Juan, Mayagüez, Quebradillas, Ensenada.

Osborn 29-90 and 35-121:

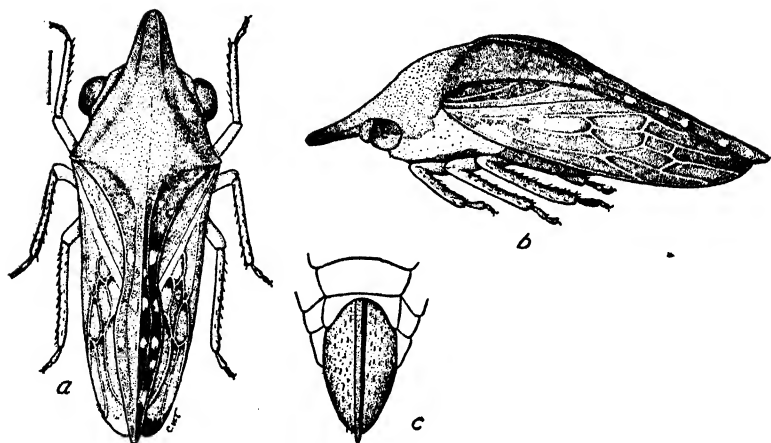
AMC: at Humacao xi-30, Luquillo vii-32, Sabana Llana xii-30, Santurce vi-30, Trujillo Alto i-31, Coamo Springs ix-29, Aguadilla v-31, Utuado viii-30, and on eight dates at Mayagüez.

at light (436-12 det. Gibson, 692-12, 124-18, I No. 884), at Isla Verde (I No. 2937), at Condado (66-11, 159-15), at Martín Peña (89-16, 262-16), at Vega Alta (160-15), at Manatí (I No. 1024), at Guánica (407-14, 1136-13 det. McAtee); resting on sea-grape at Quebradillas (300-21); on grapefruit at Pt. Salinas (125-15, 179-15); nymphs in sandy soil at Mameyes (819-12), apparently feeding on roots of *Wedelia trilobata* at Pt. Salinas (GNW).

MEMBRACIDÆ

Nessorhinus gibberulus Stal

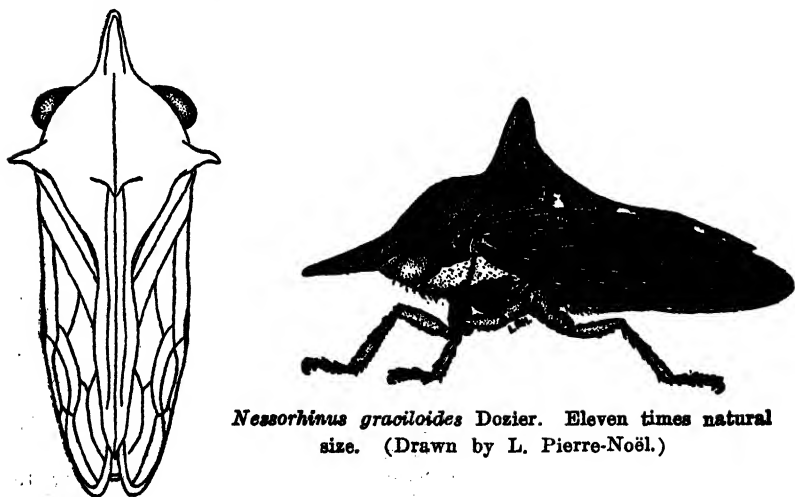
(as *Antianthe expansa* Germar—det. W. D. Funkhouser) Smyth 20-125: on cotton. Wolcott 23-46: on coffee. IP-257: Osborn 29-90:



Nessorhinus gibberulus Stal: c. female genitalia. (After Osborn.)

Dozier 31-3: synonymy. Osborn 35-124: illustration and notes. AMC: at Algarrobo iv-30, Mayagüez ix-30.

on tomato (179-16), on *Spondias lutea* (724-16), on guava (1119-16), on *Cissus sicyoides* (430-21), on mulberry (131-22); on grapefruit (178-16, 550-16, 330-17), at Vega Baja (553-16), at Vega Alta (228-17); on tobacco at Cayey (38-16); on vine, *Trichostigma octandra*, at Cayey (354-22); on *Inga vera* at Mayagüez (267-23); on *Solanum torvum* at Ciales (223-22), at Bayamón (508-17); on gandul at Comerío (762-13); on coffee at Corozal (283-21), at Ciales (465-21), in mountains north of Yauco (197-23), at Utuado

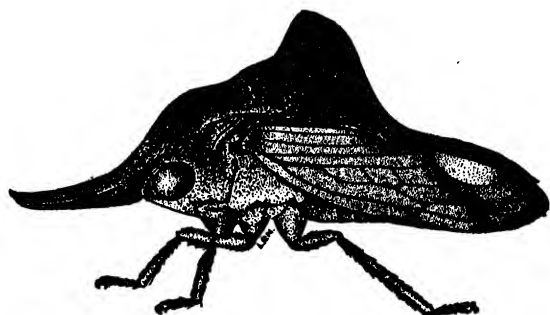
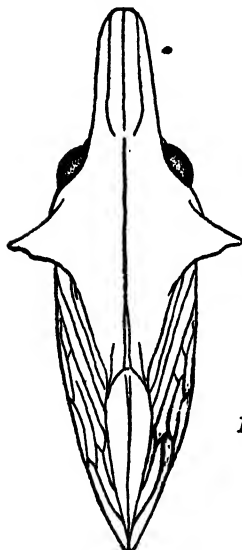


Nessorhinus graciloides Dozier. Eleven times natural size. (Drawn by L. Pierre-Noël.)

(477-21), at Adjuntas (I No. 3125), at Cidra (I No. 2620, 4288, 4289); on ñame at Hormigueros (I No. 5889, 5890); on pomarrosa at Arecibo (I No. 5025, 5026).

Nessorhinus graciloides Dozier 31-3, fig. 3: TYPE from Caguas, P. R.

Osborn 35-125: Dozier's figure and notes.



Nessorhinus vulpes Amyot & Serville. About ten times natural size. (Drawn by L. Pierre-Noël.)

Nessorhinus vulpes Amyot & Serville

Osborn 29-90: at Lares and Mayagüez, det. W. D. Funkhouser.

Osborn 35-125: figure from Dozier 31-2.

on icaco at Arecibo (I No. 2393).

Paradarnoides ? sp. nov.—det. P. W. Oman

on robe at Ponce (I No. 4771).

? **Micrutalis** ?—det. P. W. Oman

on pomarrosa at Aibonito (I No. 5607); on mocha at Juana Díaz (I No. 4680).

Monobelus fasciatus F.—det. W. D. Funkhouser.

Wolcott 23-46: on coffee. Osborn 29-90: records from IP-257.

Wolcott 24-22, 26: eaten by *Anolis pulchellus* and *A. stratulus*. Osborn 35-122: short description and previous records.

AMC: at Río Piedras vii-31, Barrois x-30, Matrullas x-32, Ponce xii-30, Aguadilla xii-32, Utuado xii-30, xii-32, Añasco ii-29, and Mayagüez x-30.

at Cidra (I No. 2621), at Ponce (I No. 3924); on *Spondias lutea* (782-16), on *Erythrina glauca* (785-13, 964-16); on *Solanum nigrum* at Vega Baja (532-16); on *Inga laurina* at Lares (638-21, 149-22), at Mayagüez (266-33); on gándul at

Comerio (763-13, 769-13); on mulberry (236-23); on *Ficus stahlii* at Manatí (237-23); on yautía at Mayagüez (I No. 4900); on almendra at Bayamón (I No. 2066 Leonard 33-129, 5316).

Spinodarnoides typus Funkhouser, W. D., "New Genera and Species of Neotropical Membracidae." Jour. N. Y. Ent. Soc., Vol. 38, pp. 405-421, pl. 2. New York, December 1930: TYPE from P. R.

CERCOPIDÆ

Epicranion championi Fowler

Van Z. (608) on coffee and *Inga laurina*.

Van Zwaluwenburg 17-516: "fairly common (on coffee); spittle masses around a berry cluster often contain as many as six nymphs."

Osborn 29-90: quoting records.

Osborn 35-126: quoting Fowler's description and other records. on coffee at Lares (129-21); nymphs common on coffee thruout the coffee districts.

Philaenus fusco-varius Stal—det. W. L. McAtee

Osborn 29-90: quoting records.

Osborn 35-127: "gray, varied with fuscous, minutely pilose." (as *P. lincatus*) AMC: at Cartagena Lagoon V-31, and on four dates at Mayagüez.

on weeds (734-17, I No. 5070), on mulberry (131-22); on pomarrosa at Bayamón (I No. 2449-B Leonard 33-123); on *Inga vera* at Aibonito (I No. 4361); on *Inga laurina* at Mayagüez (268-23); on guava at Bayamón (I No. 3364), at Cidra (I No. 2614), at Arecibo (I No. 4946).

Clastoptera brevis Walker

Osborn 35-128: "credited to Porto Rico by Lallemand."

(as sp.—det. P. W. Oman) on El Yunque (I No. 5405); on mangrove at Ponce (I No. 4603).

CICADELLIDÆ (JASSIDÆ)

Agallia albidula Uhler

(as *A. tenella* Ball) Barret 04-448, Howard 04-88 (quoted by Jones 15-2 to 3): injurious to beans, cowpeas and other plants.

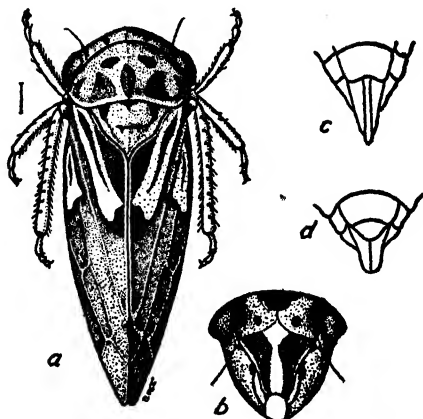
(as *A. tenella* Ball) Wolcott 21-19, fig. 5; on sugar-cane, in abundance at Garrochales; on *Solanum torvum* and potatoes. Leonard 33-114: on cassava melon.

Osborn 29-91: common on *Amaranthus* at Salinas.

Osborn 35-130, fig. 7: notes.

AMC: at Mayagüez ix-30.

on carrots (539-17, 531-17, 686-17), at Utuado (I No. 3726); on string beans (206-16) at Aibonito (I No. 2930), on lima beans at Loíza (I No. 1610); on *Agati grandiflora*, causing con-



Agallia albidula, Uhler: b, face, c, female & d, male genitalia. (After Osborn.)

siderable injury (155-21), on weeds (431-17), on grass (450-16, 452-16); on *Solanum indicum* at Mayagüez (I No. 3252); on egg-plant (448-16); on tomato at Loíza (I No. 1618 Leonard 33-128); on potatoes at Jájome Alto (21-21); all stages on tobacco (591-16), at Cayey (21-21); on squash and cucumber at Bayamón (I No. 3272); on watermelon (I No. 275), at Arecibo (I No. 1214); on asparagus at Cidra (I No. 2893); on cotton at Camuy (228-21).

Agallia pepino DeLong & Wolcott, IP-258: TYPE at Ciales, P. R., from carpet grass, *Axonopus compressus*; on sugar-cane at San Sebastián.

Osborn 29-91: swept from vegetation at Cayey, Yabucoa, Ciales and Río Piedras.

Osborn 35-130: quoting description.

at Bayamón (I No. 2977), at Naguabo (I No. 3942); on tender leaves of mulberry (363-23); at light at Mayagüez (269-23, I No. 2406 Leonard 33-133).

Agallia pulchra DeLong & Wolcott, IP-259: TYPE at Lares, P. R., from *Inga laurina* (164-22), others on carrots (686-17), on sugar-cane at Guánica (138-21); on coffee at Lares (393-21), at Utuado (476-21), in mountains north of Yauco (305-21, 85-22, 194-23).

Osborn 29-91: swept from vegetation at Cayey and Lares.

Osborn 35-129: quoting description and records from IP-259.

EEWI-323: a very minor pest on coffee.

on El Yunque (I No. 5405).

Agallia sticticollis Stal

(as *A. carrotovora*) DeLong & Wolcott, IP-258: on carrots at Río Piedras, P. R. (R. T. Cotton).

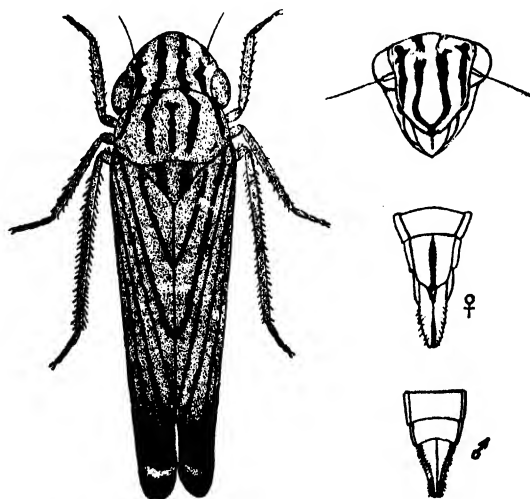
Osborn 29-91: synonymy and notes.

Osborn 35-131: description and notes.

swept from grass at Bayamón (I No. 3363).

Idiocerus parvulus Osborn 35-132: TYPE from San Germán, P. R.

Entogonia (Cicadella) coffeaphila Dozier, H. L., "Some New and Interesting Porto Rican Leafhoppers." Jour. Dept. Agr. P. R., Vol. 10, Nos. 3 & 4, pp. 269-265, fig. 4. San Juan, September 1927: TYPES on coffee, jobo and *Inga laurina* at Cayey, Aibonito, Barros, Mayagüez, Jayuya, Adjuntas, mountains north of Yauco and on El Yunque, P. R.



Entogonia coffeaphila Dozier. Ten times natural size. (Drawn by H. L. Dozier.)

Dozier 31-6; generic transfer.

Osborn 29-92, 35-133: quoting Dozier.

EEWI-323: a minor pest on coffee.

(as part of *Tettigonia occatoria* Say) Van Z. (627) on coffee and *Inga laurina*. Wetmore 16-66: eaten by Tody. Wolcott 21-20: on sugar-cane at Morovis (the specimen is *coffeaphila*). IP-259:

specimens re-determined by GNW: on coffee at Adjuntas (487-21), at Larcs (289-21); on orange at Jácome Alto (22-21); on stems of fresa, *Rubus rosaeifolius*, at Adjuntas (234-22); on *Solanum torvum*, *Heckeria peltata*, *Phytolacca decandra* and coffee in mountains north of Yauco (234-22

TYPE); nymphs on *Heckeria peltata* at Vega Alta (106-21). Determinations by P. W. Oman: on El Yunque (I No. 2017 Leonard 33-133); on pomarrosa at Vega Alta (I No. 5357).

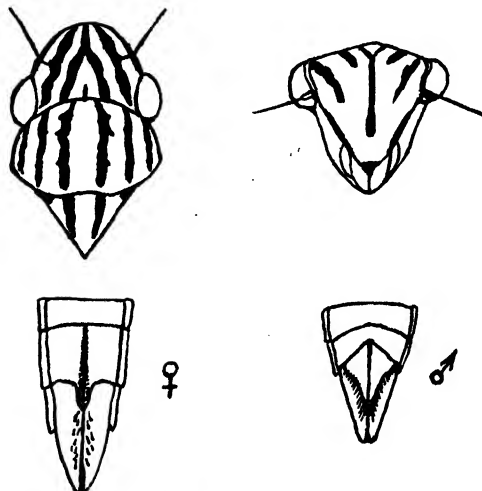
Entogonia (Cicadella) coffeacola Dozier 27-264, fig. 4: TYPE from Río Piedras, others on El Yunque, Cayey, Aibonito, Adjuntas, P. R.

Dozier 31-6: generic transfer.

Osborn 29-92 & 35-134: quoting Dozier.

EEWI-323: a minor pest of coffee.

(as part of *Tettigonia occatoria* Say) Van Z. (627) on coffee and *Inga laurina*. IP-259:



Entogonia coffeacola Dozier. (Drawn by H. L. Dozier.)

specimens re-determined by GNW: common on tender stems of coffee at Río Piedras (47-21, 82-21 det. as *Tettigonia occatoria* Say by W. L. McAtee, as identified by Fowler in Biol. Cent. Amer., 266-21 TYPE), in mountains north of Yauco (87-22), at Lares (289-21), at Maricao (I No. 1255 det. P. W. Oman), at Ponce (I No. 2575).

Entogonia lineata Osborn 35-136: TYPE from El Yunque, P. R., "fairly close to Dozier's *coffeacola*."

Tettigonia interrupta Signoret—det. W. L. McAtee.
resting on eggplant at Bayamón (I No. 594).

Cicadella sirena Stal

(as *Tettigonia*) Smyth 19-145: on "sugarcane, citrus, coffee, sesame, garden plants. Wolcott 21-20, fig. 6: on gramma grass and sugar-cane. Tower 22-24: unsuccessfully used in

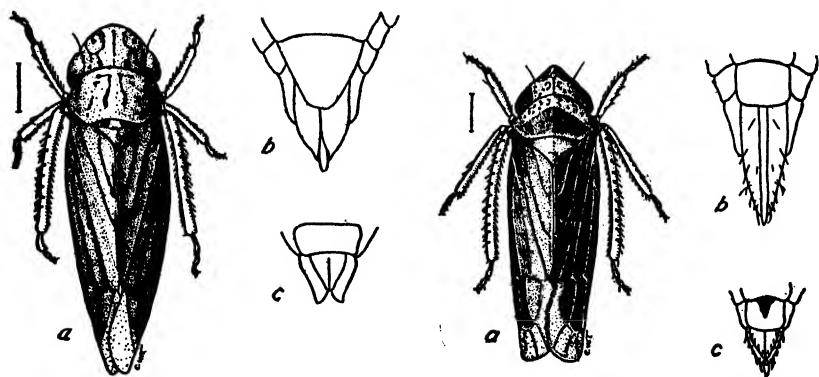
transmission of mosaic disease of sugar-cane experiment. IP-259:

Osborn 29-93: on *Sesuvium* at Aguirre, on *Barita* near Ponce, also at Sabana Abaca, Salinas and Arecibo.

Osborn 35-136, fig. 10: re-description.

AMC: at Río Piedras xii-30, Algarrobo iii-31, x-30, Villalba xi-29, Salinas xii-33, Ponce vii-33, xii-33, xii-31, Faro de Cabo Rojo v-31, and on seven dates at Mayagüez.

on malojillo grass *Panicum barbinode*, (439-16, 519-17), on weeds (430-17), on *Urena lobata* (150-17), on sesame (771-11), on carrots (574-17, 529-17), on *Agati grandiflora* (156-21); on grapefruit at Vega Baja (534-16); on gandul, *Cajanus cajan*, at Comerio (760-13 det. Heidemann, 770-13); on coffee at Lares (290-21), at Ciales (224-22); on weeds at Bayamón (509-17); on sugar cane at Hormigueros (35-22), at Bayamón, Barceloneta, Córscica, Adjuntas and Guánica (GNW); on Bougainvillea vine at Pt. Cangrejos (GNW); on okra at Trujillo Alto (I No. 1410 Leonard 32-134); on almendra at Arecibo (I No. 2397 Leonard 33-129); on orchids at Santurce (I No. 4145); on ñame at Isabela (I No. 5824); on malojillo (I No. 1360).



Cicadella sirena Stal: b, female & c, male genitalia. (After Osborn.)

Cicadella similis Walker: b, female & c, male genitalia. (After Osborn.)

***Cicadella similis* Walker**

(as *Tettigonia*) Van Dine 11-31; Van Dine 12-22; Van Dine 13-257: on sugar cane.

(as *Kolla*) Smyth 18-118; Smyth 19-145; on malojillo grass and young sugar cane.

(as *Kolla*) Smyth 19-99; Tower 22-24; Wolcott 23-45: unsuccessfully used in mosaic disease of sugar cane transmission experiments.

- (as *Kolla*) Wolcott 21-22 to 28, fig. 8: the most extended account; life history and abundance as affected by size of cane, contour of field, and rainfall. Illustration of adult and nymph.
- (as *Kolla*) Chardón 23-64 to 67: abundance in fields of young cane where mosaic disease is spreading.
- (as *Kolla*) Wolcott 24-18, 23, 26, 32, 34: eaten by *Anolis pulchellus*, *A. krugii*, *A. stratulus*, and *A. cristatellus*.
- (as *Kolla*) Wolcott 25-50: juice of cane a perfect food for, excrement of is clear, colorless, tasteless liquid, devoid of sugar.
- Osborn 29-92: notes, generic transfer.
- Osborn 35-137, fig. 11: quoting re-description and notes.
- AMC: at Guayama iii-29, Humacao i-30, Juncos xii-29, Algarrobo iii-31, Las Marías iv-29, Lajas xii-32, Cabo Rojo xi-30, Cartagena Lagoon iii-31, v-30, and on ten dates at Mayagüez.
- on sugar cane (218-13, 286-19), at Naguabo (35-10 det. Heidemann as *Tettigonia*), at Fortuna (54-10), at Hormigueros (36-22), at Toa Alta (453-21); on grass in coffee grove at Ciales (62-21); on weeds (429-17, 516-17), on corn (447-17), on carrots (530-17), on beans (202-16). Nymphs on sugar cane (164-19, 221-19), eggs in leaves of sugar cane (319-12, 287-19), parasitized by *Brachistella prima* Perkins, *Ufens niger* Ashmead and *Oligosita cemosipennis* Girault (335-12 eggs det. GNW, parasites det. A. A. Girault); on squash (I No. 3519-C); on rice at Orocovis (I No. 3093); in malojillo grass at Bayamón (I No. 2359 Leonard 33-116); at light at Mayagüez (I No. 2322, 2408, 4819).

***Kolla fasciata* Walker**

- (as *K. fuscolineella* Fowler) Wolcott 21-22, fig. 7: on St. Augustine, Bermuda and carpet grass, on sugar cane and malojillo grass, commonest in the hills. Illustration of adult.
- (as *K. fuscolineella* Fowler) Wolcott 24-18, 23: eaten by *Anolis pulchellus* and *A. krugii*.
- Osborn 29-93: swept from vegetation at many localities.
- Osborn 35-139, fig. 12: quoting re-description and notes.
- AMC: at Juncos xii-29, Algarrobo iii-31, Lajas xii-32, Toro Negro i-32, and on eight dates at Mayagüez.
- on carpet grass in coffee grove at Ciales (63-21); on sugar cane at Toa Alta (450-21), at Corozal (GNW—det. as *Tettigonia arcuifera* by Mr. Gibson), at Río Piedras and Coloso (GNW); swept from weeds (I No. 2593), at Mayagüez (I No. 4562, 4820).

***Carneocephala* (*Draeculacephala*) *sagittifera* Uhler**

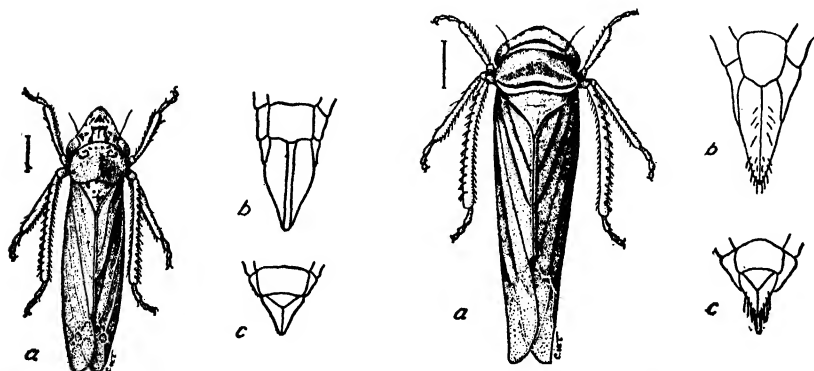
- (as *D.*) Wolcott 21-28, fig. 10: on sugar-cane, not abundant.
- (as *D.*) Wolcott 24-12, 32: eaten by *Ameiva exsul* and *Anolis pulchellus*.

(as *D.*) Osborn 29-93: Bermuda grass the favorite host.

Osborn 35-140, fig. 13: re-description.

AMC: at San Juan viii-31, Mayagüez xii-30.

on sugar cane at Hornigueros (33-22), at Guánica (139-



Kolla fasciata Walker: *b*, female & *c*, male genitalia.
(After Osborn.)

Carneocephala sagittifera Uhler: *b*, female & *c*, male genitalia.
(After Osborn.)

21); nymphs and adults common on Bermuda grass (260-21), at Aguada (GNW), at Arecibo (I No. 5022), at Mayagüez (I No. 4561).

Xerophloea viridis F.—det. W. L. McAtee

Wolcott 24-32: eaten by *Anolis cristatellus*.

Osborn 29-93: on grass at Guánica, on *Barila* at Ponce; also at Guayama and Aguirre.

Osborn 35-141, fig. 14: re-description, from Desecheo Id.

common on carrots (528-17, 648-17); on grass at Aguadilla (232-22); at light at Yauco 304-21).

Xerophloea breviceps Osborn 35-143, fig. 15: TYPE from San Juan, P. R., "approaches the gray-colored male of *viridis* but is much smaller and the vertex shorter and less angulate."

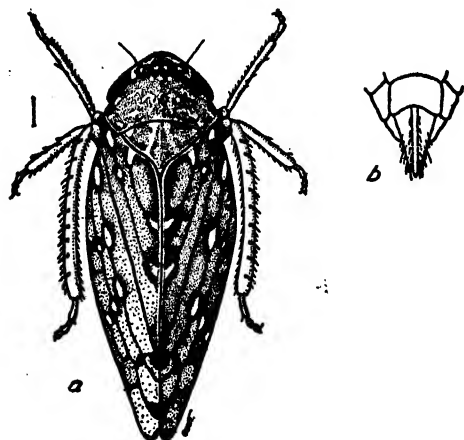
Xestocephalus maculatus Osborn 29-94 : TYPE from Cayey, P. R., on *Inga*.

Osborn 35-145, fig. 16: quoting description and notes.
at light at Mayagüez (I No. 2407 Leonard 33-133).

Xestocephalus pulicarius Van Duzee—det. Z. P. Metcalf

Wolcott 24-15, 18, 21, 23, 26, 32, 34: eaten by *Anolis evermanni*, *A. pulchellus*, *A. krugii*, *A. stratulus*, *A. cristatellus* and *A. gundlachi*.

Osborn 29-94: locality records. Osborn 35-144: re-description.
on coffee (78-21), at Lares (392-21), in mountains north of Yauco (195-23); at light at Pt. Cangrejos (GNW).



Xestocephalus maculatus Osborn: *b*, female genitalia.
(After Osborn.)



Xestocephalus pulicarius Van Duzee. Twelve times natural size. (Drawn by G. N. Wolcott.)

Xestocephalus pallidus Osborn 35-146: TYPE from El Yunque, P. R.

Spangbergiella vulnerata Uhler

Wolcott 21-29: from sugar-cane and malojillo grass, rare.

Osborn 29-94: on Guinea grass.

Osborn 35-146, fig. 17: quoted re-description and notes.

swept from weeds (432-17), at light (157-23); at Camuy (GNW), on Vieques Id. (GNW), at Loíza (I No. 4228 as "sp.").

Spangbergiella sp. prob. new—det. P. W. Oman
on casuarina (I No. 3003).

Sanctanus (Scaphoideus) fasciatus Osborn—det. E. D. Ball
(as *Scaphoideus*) Wolcott 21–31: on sugar-cane at Bayamón,
at light at Pt. Cangrejos.

(as *Scaphoideus*) Osborn 29–94: on Guinea and other grasses.
Osborn 35–147, fig. 18: quoted description, notes.
at light (329–21).

Sanctanus fasciatus var. *variabilis* Osborn 35–149, fig. 19: TYPE
from Aguirre, other from Patillas, P. R.

Scaphoideus bimarginatus DeLong, IP-261 pl. 1, fig. 1: TYPE
from Pt. Cangrejos, P. R., at light (GNW).

Osborn 29–95: note. Osborn 35–150: quoting description and
note.

Platymetopius frontalis Van Duzee—det. P. W. Oman
on crotalaria at Arecibo (I No. 3640).

Platymetopius loricatus Van Duzee

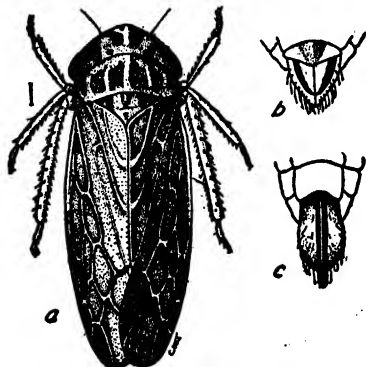
Osborn 29–95: swept from vegetation at Aguirre.

Osborn 35–150, fig. 20: quoted re-description and notes.
(presumably this sp.) on string beans (207–16).

Deltocephalus albivenosus Osborn

Osborn 29–96: from beach grass at San Juan, Luquillo and
Añasco.

Osborn 35–152, fig. 21: quoting description and notes.



Deltocephalus flavicosta Stal: *b*, fe-
male & *c*, male genitalia. Twelve
times natural size. (After
Osborn.)

Deltocephalus flavicosta Stal—det. D. M. DeLong

(as *D. contestus* Uhler MS) Gundlach.

(as *D. senilis* Uhler—det. Z. P. Metcalf) Wolcott 21–29, fig.
11: on sugar-cane and malojillo grass.

Wolcott 24–15, 18, 21, 26, 32: eaten by *Anolis evermanni*, *A.*
pulchellus, *A. stratulus* and *A. cristatellus*.

Osborn 29-96: widely distributed but not particularly abundant, in pastures and on Guinea grass.

Osborn 35-155, fig. 23: quoted description, re-description and notes.

at light (569-17), on carrots (541-17, 538-17, 685-17); on sugar-cane at Hormigueros (34-22); on weeds at Arecibo (I No. 2456); swept from grass at Bayamón (I No. 2978, 3363).

***Deltocephalus maculellus* Osborn**

Osborn 29-96: at Guayama, Fortuna and Coamo.

Osborn 35-153, fig. 22: quoting description and notes.

***Deltocephalus nigripennis* DeLong, IP-263, pl. 1, figs. 3 & 3a:**

TYPE from grass at Boquerón, P. R. (GNW).

Osborn 29-96: no additional collections.

Osborn 35-154: quoting description and notes.

at light at Mayagüez (I No. 2403 Leonard 33-133).

***Deltocephalus sonorus* Ball—det. D. M. DeLong**

Osborn 29-95: on grass at Aguirre.

Osborn 35-156: short re-description and notes.

on malojillo grass at Pt. Cangrejos (GNW).

***Deltocephalus trilobatus* DeLong, IP-263, pl. 1, fig. 2a: TYPE**

from Pt. Cangrejos, P. R., at light (GNW).

Osborn 29-95: on scanty pasture grass in hills north of Salinas; Arecibo, beach at Sabana Abaca and Aguirre.

Osborn 35-152: quoting description and notes.

***Euscelis (Athysanus) striolus* Fallen—det. D. M. DeLong**

Osborn 29-97: not collected.

on malojillo grass at Pt. Cangrejos (GNW).

***Exitianus (Euscelis) obscurinervis* Stal**

(as *Athysanus exitiosus* Uhler—det. E. D. Ball) Wolcott 21-30, fig. 12: on sugar-cane at Patillas and Hatillo, rare.

Osborn 29-96: nymphs and adults plentiful on Bermuda grass.

Osborn 35-157, fig. 24: quoted re-description and notes.

on weeds at Arecibo (I No. 2454 Leonard 33-132), at Manatí (I No. 4394); on ñame at Mayagüez (I No. 5822, 5823 as "var. *picatus* Gibson" det. P. W. Oman).

***Acinopterus angulatus* Lawson**

(as *A. acuminatus* Van Duzee—det. D. M. DeLong) IP-264: swept from grass at Boquerón (99-23).

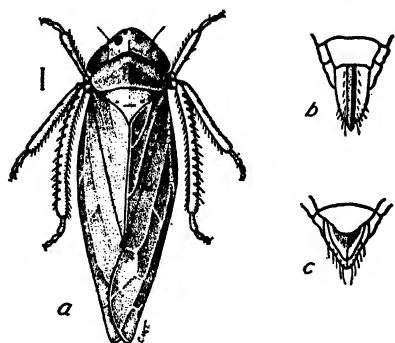
Osborn 29-97: on the south coast.

Osborn 35-159, fig. 25: short re-description. At San Juan.

***Thamnotettix colonus* Uhler—det. Z. P. Metcalf**

Wolcott 21-30, fig. 13: on sugar cane and malojillo grass, but commonest on carpet grass, *Axonopus compressus*, in the hills.

(as *Tettigonia similis* Walker—a misidentification) Johnston 15-23: killed by *Empusa muscae* (provisional determination).



Thamnotettix colonus Uhler: *b*, female
& *c*, male genitalia. Twelve times
natural size. (After Osborn.)

Wolcott 24-3: one individual in 3 sq. ft. of pasture at Pt. Cangrejos.

Wolcott 24-21, 23: eaten by *Anolis pulchellus* and *A. krugii*.

Osborn 29-97: on Bermuda and St. Augustine grasses at many localities.

Osborn 35-161, fig. 28: quoting description.

on sugar-cane (654-12); on grass (451-16), at Bayamón (I No. 2979); on tobacco (1153-16); at light at Mayagüez (I No. 2405 Leonard 33-133, 127-23).

***Thamnotettix comatus* Ball—det. D. M. DeLong**

Osborn 29-98: confirming DeLong's tentative identification.

Osborn 35-162, fig. 29: quoting redescription and notes.

on carrots (532-17), at light (I No. 5589), swept from grass at Bayamón (I No. 2979, 3363), at Arecibo (I No. 5023).

***Thamnotettix cubana* Osborn**

Osborn 29-97: on grass at Guayama and Aguirre.

Osborn 35-159, fig. 26: quoting description and notes.

***Thamnotettix rubicundula* Van Duzee**

Osborn 29-98: on *Sesuvium portulacastrum* at Aguirre, Coqui and Ensenada. Osborn 35-160, fig. 27: redescription.

***Thamnotettix nigrifrons* Forbes—det. GNW**

Osborn 29-98: at Santa Rita, Luquillo and Loíza Aldea.

Osborn 35-163, fig. 30: short description.

on carrots (532-17).

***Chlorotettix minimus* Baker**

(as sp.) Wolcott 21-31 fig. 15: on sugar-cane at many localities, at light at Pt. Cangrejos.

Osborn 29-99: notes and locality records.

Osborn 35-164, fig. 31: quoting re-description and notes.

on grass at Bayamón (I No. 2981); on asparagus at Cidra (I No. 2893-c).

Chlorotettix nigromaculatus DeLong & Wolcott, IP-265: TYPE from Río Piedras, P. R.

Osborn 29-99 and 35-166: not since found in P. R.

Chlorotettix tethys Van Duzee

(as *C. bidentatus* sp. nov.) DeLong, IP-264: TYPE from Pt. Cangrejos, another from Guánica, P. R.

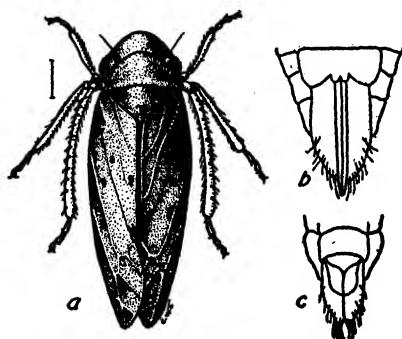
Osborn 29-99: synonymy; "the most common species of the genus taken—mainly on grasses, at San Juan, Águirre, Patillas and Ponce.

Osborn 35-165, fig. 32: quoting re-description.

(as sp.) Wolcott 21-32, fig. 16: on sugar-cane at Guánica and Patillas, at light at Pt. Cangrejos.

(as sp.) Wolcott 24-18, 21: eaten by *Anolis pulchellus*.

on weeds (567-16, I No. 5510), at Humacao (689-17); on sweet potato (201-17).



Chlorotettix tethys Van Duzee: *b*, female & *c*, male genitalia. (After Osborn.)

Chlorotettix viridius Van Duzee—det. D. M. DeLong

Osborn 29-99: at Luquillo.

Osborn 35-164: short description.

at light at Pt. Cangrejos (GNW).

Jassus obligatus Osborn 35-167, fig. 33: TYPE from Quebradillas, P. R., on *Ficus laevigata* (GNW).

(as *Jassus obligatus* Uhler—det. W. L. McAtee) IP-265 and Osborn 29-100:

on leaves of *Ficus laevigata* at Quebradillas (221-21 TYPE);

on robele at Ponce (I No. 4772 det. as "sp." P. W. Oman).

Cicadula maidis DeLong & Wolcott, IP-265, pl. 1, fig. 4a & 4b: TYPE from San Sebastián, P. R., on corn, the normal and common host, (102-21); on sugar-cane (645-12), on carrots (540-17).

EEP-42: a pest on corn. Osborn 29-100: on corn.

EEWI-247: a pest of corn; short description.

Mackie, D. B., Insect Pest Survey, Vol. 14, No. 9, p. 284. Washington, D. C., Nov. 1, 1934: "(California Oct. 2.) A leaf-hopper, *Cicadula maidis*, reported in Cuba and Porto Rico, was first taken in 1933 in San Bernardino, and in 1934 was reported attacking corn in Los Angeles County. These constitute the first records for the United States. A survey of California shows that the species is present in the eight southern counties from Kern and Santa Bárbara to the Mexican border."

Osborn 35-169: quoting description and notes.

on corn, parasitized by a blue-green strepsipteran (79-33), at Barceloneta (I No. 3213); on peas at Aibonito (I No. 2931).

***Cicadula sexnotata* Fallen**

Wolcott 21-31: on sugar-cane at Patillas and Garrochales.

Osborn 29-100: "taken from grasses at a number of points."

Osborn 35-169, fig. 34: re-description.

(as *C. divisa* Uhler = det. P. W. Oman) at light (I No. 5588), on grass at Bayamón (I No. 2982).

***Cicadula 6-notata* var. ?**

Osborn 29-100 and 35-169: between Cayey and Jájome Alto.

***Balclutha abdominalis* Van Duzee**

Davidson, R. H., & DeLong, D. M., "A Review of the North American Species of *Balclutha* and *Agellus* (Homoptera: Cicadellidæ)". Proc. Ent. Soc. Washington, Vol. 37, No. 5, pp. 97-112, pl. 2. Washington, D. C., May 1935: on p. 100, listed from P. R.

***Balclutha hyalina* Osborn**

Osborn 29-101 and 35-170: between Cayey and Jájome Alto.

***Agellus bisinuatus* DeLong** (as *Eugnathodus*) IP-266, pl. 2, figs. 2a & 2b: TYPE from a large series of specimens from seed heads of malojillo grass, *Panicum barbinode*, at Río Piedras, P. R., March 2, 1923 (GNW), others on sweet potato (202-17), on carrots (448-17), on sedge, *Cyperus ferox* (222-13 det. as *Gnathodus* sp. by Mr. Gibson), on Bermuda grass (261-21), on sugar cane (298-19, 218-19, 546-16), on sugar cane or malojillo at Coloso, Vega Alta, Mauatí and Bayaney (GNW). (as *Balclutha* sp. (*Gnathodus*) in part, and also as No. 49, "not yet determined") Smyth 19-107, and 19-146: on sugar cane and malojillo grass seed-heads (the name given by Smyth for "malojillo", *Eriochloa subglabra*, is not a synonym of *Panicum barbinode*, but both grasses are called "malojillo" in Porto Rico, being similar in appearance and often growing together.)

(as *Balclutha osborni* Van Duzee) Wolcott 21-32: on sugar cane and malojillo grass.

(as *Eugnathodus*) Wolcott 24-18: eaten by *Anolis pulchellus*.

(as *Eugnathodus*) Osborn 29-102: at Vega Alta and Río Piedras.

(as *Nesosteles*) Osborn 35-171: quoting original description. Davidson & DeLong 35-106: re-description and synonymy.

on malojillo at Bayamón (I No. 3363), at Barceloneta (I No. 3673), at Arecibo (I No. 4399), at Pueblo Viejo (I No. 3854, 3855), swept from weeds (I No. 2592, 3715); on peas at Aibonito (I No. 2931, 2932); on asparagus at Cidra (I No. 2893-D); on squash at Vega Baja (I No. 3597); on cucumber at Vega Baja (I No. 3612)—all det. P. W. Oman.

Agellus calcarus DeLong & Davidson

Davidson & DeLong 35-108: listed from P. R.

Agellus flavidus Osborn

at Naguabo (I No. 3941 as *Eugnathodus* det. P. W. Oman).

Agellus guajanae DeLong (as *Eugnathodus*) IP-267, pl. 2, fig. 1a & 1b: TYPE from a series from arrows of sugar-cane or "guajanas" at Río Piedras, P. R. (377-22), others at Aguadilla (31-22), at Vega Alta (GNW) and from Vieques Id. (Dec. 20, 1919, GNW).

(as "Cane Seed-Head Leafhopper" (*Balclutha* sp.) in part) Smyth 19-107: "In December and January it occurred in the greatest abundance in the seed tassels of such cane plants as bore seed, and is believed to have been a principal cause of the low fertility of the seed. For this reason it may be a serious retarding factor in production of new cane varieties. The nymphs, which are dark in color with lighter dorsal stripe, could be shaken by thousands from a single cane seed tassel. They are heavily preyed upon by larvæ of a Syrphid fly" (*Allograptus limbata* Fabr.).

EEWI-223: on arrows of sugar-cane.

(as *Eugnathodus*) Osborn 29-102: swept from grass.

(as *Nesosteles*) Osborn 35-172: quoting description and notes. Davidson & DeLong 35-105: listed from P. R., re-description. on grapefruit at Bayamón (I No. 2402 det. P. W. Oman).

Agellus minutus Osborn (as *Eugnathodus*) 29-101: TYPE from a series "collected from matted grass at sea level, salt flat association, Aguirre, P. R."

(as *Nesosteles*) Osborn 35-173, fig. 35: quoting original description and notes.

Davidson & DeLong 35-106: shortened description and notes.

Agellus neglectus DeLong & Davidson

(as *Eugnathodus abdominalis* Van Duzee) Osborn 29-101: "included in Wolcott's list" (actually *not* mentioned); collected at Lares, Arecibo, Fortuna, Mayagüez, Río Piedras and between Cayey and Jájome Alto.

(as *Nesosteles*) Osborn 35-176, fig. 38: "the true *abdominalis*—a *Balclutha*;" at Aguirre, Arecibo, Fortuna.

Davidson & DeLong 35-104: listed from P. R.

Agellus pallidus Osborn

(as *Eugnathodus*) Osborn 29-101: at Río Piedras.

(as *Nesosteles*) Osborn 35-174, fig. 36: quoting description.

Agellus rosaceus Osborn (as *Eugnathodus*) 29-102: TYPE "from a series of twenty females collected from seed heads of a sedge, *Fimbristylis spadicea*, at Aguirre," P. R.

(as *Nesosteles*) Osborn 35-175, fig. 37: quoting description.

Davidson & DeLong 35-106: re-description.

Agellus virescens Osborn

(as *Eugnathodus*) Osborn 29-101: on grass at Río Piedras.

(as *Nesosteles*) Osborn 35-175: quoting description.

Davidson & DeLong 35-109: listed from P. R.

Protalebra aureovittatus DeLong (as *Alebra*) IP-267, pl. 2, figs. 3, 3a, 3b: TYPE from ? tree at Ciales, P. R. (221-22).

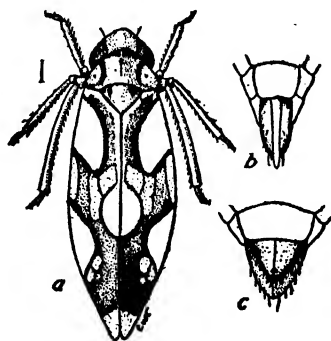
Osborn 29-105: at Yabucoa and between Cayey and Jájome Alto, synonymy with *P. pallida* Osborn from San Sebastián.

Osborn 35-178: quoting description and notes.

Protalebra bifasciata Gillette—det. W. L. McAtee

Dozier 27-261: from a thorny leguminous bush in ravine near Juana Díaz.

Osborn 29-105 and 35-183: no additional records.



Protalebra braziliensis Baker: b, female & c, male genitalia. Fourteen times natural size.
(After Osborn.)

Protalebra braziliensis Baker—det. D. M. DeLong

(as *Erythroneura comes* Say) Wolcott 21-31, fig. 14: on sugarcane and *Wedelia trilobata*; notes on nymphs.

Dozier 27-260: "the most abundant and generally distributed *Protalebra* in P. R., being commonly met with in cane fields and in weedy places."

Wolcott 24-13, 21: eaten by *Anolis pulchellus*.

Leonard 2-140: on *Bidens pilosa*.

Osborn 35-181, fig. 41: at Cataño; quoted re-description.

on carrots (533-17, 572-17, 683-17); at light at Mayagüez (I No. 4339), at Adjuntas (I No. 3994).

Protalebra cordiae Osborn 29-102: TYPE on *Cordia* sp. at Aguirre, others at Cataño, P. R., description of nymphs.

Osborn 35-179, fig. 39: quoting description and notes.

Protalebra lenticula Osborn 29-103: TYPE and others from Coamo, P. R.

Osborn 35-180, fig. 40: quoting description.

at light at Bayamón (I No. 2323 Leonard 33-133).

Protalebra similis Baker

Osborn, Herbert, Ann. Carnegie Mus., Vol. 18, p. 264. Pittsburgh, 1928: at Vega Baja.

Dozier 27-260: on sweet potato at Vega Baja.

Osborn 29-104: at Espinosa and Mayagüez.

Osborn 35-183: quoting re-description and notes.
on sweet potato at Vega Baja (85-24).

Protalebra tabebuiae Dozier 27-260, fig. 2: TYPE from "roble" tree at Río Piedras, P. R.

(as *P. bicincta* Osborn sp. nov.) Osborn 28-259: described from Dozier's material.

Osborn 29-104 and 35-180: quoting re-description and notes.

on almendra at Bayamón (I No. 5346); on "roble blanco" (*Tecoma pentaphylla*) *Tabebuia pallida* (88-24 TYPE).

Protalebra ziczac Osborn 29-104; TYPE from Añasco, P. R.

Osborn 35-182, fig. 42: quoting original description and notes.

Empoasca fabae Harris

Osborn 35-184: quoting description; specimens identified by DeLong at Lares and Cataño.

Empoasca fabalis DeLong (TYPE from Haiti)

(as *E. mali* Le Baron) Barrett 04-448: "severest insect enemy of beans and cowpeas."

(as *E. mali*) Jones 15-3: "acute injury to garden beans, the leaves being badly curled and distorted."

(as *E. mali*) Cotton 18-276: on a great variety of plants, greatest damage to beans.

(as *E. mali*) Wolcott 21-33: "on cane when beans are growing between the rows."

(as *E. mali* Le Baron—re-determined as *E. flavescens* F. by D. M. DeLong) IP-269: the following records, some of which may be *E. fabae*, but presumably are not:

on beans (406-13, 445-16, 480-16, 636-17, 444-17), on tobacco (1154-16), on carrots (534-17), beets (407-19), on sweet

potatoes (449-17), all stages abundant on *Agati grandiflora*, causing yellowing and shedding of leaves (154-21 confirmed D. M. DeLong).

(as *E. mali*) EEP-109: serious pest of beans.

Osborn 29-105: confusion of records with *E. fabæ*.

(as *E. fabanæ* DeLong) Leonard 31-117: on beans and potatoes. Leonard 32-122: on string and lima beans.

Osborn 35-185: quoting description. "The species is abundant and injurious to sweet potato, beans, morning glory, etc. Specimens definitely identified by Dr. DeLong were taken at Río Piedras, Feb. 8, 1929."

on lima beans (I No. 1203), at Loíza (I No. 1609); on tomato at Loíza (I No. 1618 Leonard 33-128); on melon at Loíza (I No. 1614); swept from malojillo at Bayamón (I No. 3363), all det. P. W. Oman.

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Empoasca gossypii DeLong

Osborn 35-186: specimens identified by DeLong from Añasco, host not given.

Empoasca minuenda Ball—det. H. L. Dozier

Dozier 27-261: "abundant on the undersides of avocado leaves at Río Piedras."

Osborn 29-105: quoting Dozier.

Osborn 35-187: quoting description.

on avocado (87-24, I No. 2122), at Loíza (I No. 3859); on grapefruit at Arecibo (I No. 2152); on maga (I No. 2883 as var. *moznettei* Ball det. P. W. Oman); on *Annona diversifolia* (I No. 1883 ? det. P. W. Oman).

Empoasca sexmaculata DeLong, IP-270 pl. 2, fig. 4 & 4a: TYPE from a pair, on "emajagua", *Partium tiliaceum*, at Pt. Canegrejos (Jan. 13 and May 29, 1920 GNW), causing yellowing of the leaves, large and small nymphs also present on host.

Osborn 29-105: not collected.

Osborn 35-187: quoting description.

Joruma brevidens DeLong (as *Empoasca*) IP-269, pl. 2, fig. 5 & 5a: TYPE from mountains north of Yauco, P. R., on young coffee leaves Aug. 24 (244-22 GNW).

Osborn 29-105: swept from weedy river margin at Loíza Aldea.

Osborn 35-188: quoting description and notes.

Joruma pisca McAtee—det. W. L. McAtee

Dozier 27-262: at Aguirre.

Osborn 29-105 & 35-188: Dozier's record.

Dikraneura marginella Baker

Osborn 29-106: swept from grass at Río Piedras.

Osborn 35-189, fig. 43: quoting re-description.

Dikraneura (Hyloidea) depressa McAtee, W. L., Jour. N. Y. Ent. Soc., Vol. 34, p. 162. New York, 1926: TYPE from Vega Alta, P. R., January 21, 1920 (GNW).

Dozier 27-261: quoting description; on undersides of the leaves of maga at Bayamón, both nymphs and adults, the former "remind one of Uncle Sam's red, white and blue".

Osborn 29-106 and 35-191: not since collected.

on maga at Vega Alta (I No. 5188); on grapefruit at Arecibo (I No. 2151—det. P. W. Oman).

Dikraneura (Hyloidea) delicata McAtee 26-162: TYPE from Cayey, others from Yabucoa, P. R.

Osborn 35-190: quoting description and locality records. "The food plant was not recognized."

Hybla maculata McAtee, W. L., "A New Neotropical Genus of Eupteryginæ (Homoptera) from Puerto Rico". Jour. Dept. Agr. P. R., Vol. 16, No. 2, pp. 119-120, fig. 1. San Juan, July 1932: TYPE from mamey at Barceloneta, others at Pt. Cangrejos, P. R.

Osborn 35-191: quoting McAtee.

Typhlocybella minima Baker

Osborn 29-106: at Río Piedras, Yabucoa, Arecibo, and on Guinea grass at Aguirre.

Osborn 35-192, fig. 44: quoting description.

swept from malojillo grass at Bayamón (I No. 3363).

FULGORIDÆ

Muir, F., "Homoptera Notes II". Proc. Hawaiian Ent. Soc. Vol. 3, No. 5, pp. 414-429. Honolulu, T. H., 1918.

Muir, F., "New and Little Known Fulgorids from the West Indies (Homoptera)". Proc. Hawaiian Ent. Soc. for 1923, Vol. 5, No. 3, pp. 461-472, pl. 1. Honolulu, T. H., 1924.

Muir, F., & Gifford, W. M., "Studies in North American Delphacidæ". Hawaiian S. P. Expt. Station Bull. No. 15, Ent. Series pp. 53, pl. 6. Honolulu, T. H., Jan. 16, 1924.

Parahydriena hyalina Muir 24-464: TYPE from Lares, P. R.

Osborn 29-107 and 35-194: no additional collections.

Dozier 31-14: from Arecibo and Mayagüez.

on coffee at Lares (130-21 TYPE); in grapefruit grove at Mayagüez (I No. 4170).

Catonia antillicola sp. nov. Dozier

Easily distinguished from the other described West Indian species by its distinctive coloration and the elongated vertex.

Vertex distinctively produced for half its length beyond the eyes, its posterior margin deeply and acutely emarginate, the sides pointedly narrowing to a slightly rounded apex; pale brown, speckled pale towards base, the median and lateral carinae brokenly infuscated, the tip with pale median and lateral lines. Frons elongate, very narrow at base adjoining the vertex, gradually enlarging to twice that width just before joining the clypeus, emarginate at apex, a very distinct median carina present for the entire length; very pale testaceous in color with three or four small fuscous markings along each lateral edge near base. Pronotum fuscous, speckled with pale, an area at each lateral margin broadly pale. Tegulae prominently pale, contrasting with the fuscous, speckled mesonotum. Elytra with a background of dark brown on the clavus and lighter brown on the remaining portions, speckled more or less distinctly with blood red of varying depth along the costal region.

Described from two specimens collected by R. T. Cotton at Río Piedras, P. R., Feb. 16, 1916 and June 19, 1917 (Acc. No. 442-17). The type is deposited in the U. S. National Museum and the paratype in the collection of the American Museum of Natural History. Name, description and notes by H. L. Dozier.

Catonia cinerea Osborn 35-195: TYPE from Yabucoa, others from Lares, Coamo Springs and Cayey, P. R.

(as *C. intricata* Uhler) Osborn 20-107:

(as "sp. nov. "det. P. W. Oman) at Vega Alta (I No. 2814); at light (I No. 3043), at Bayamón (I No. 4141); on maga at Arecibo (I No. 5108); on Hibiscus at Mayagüez (I No. 5781).

Catonia intricata Uhler

Osborn 35-195: from El Yunque; quoted description.

Bothriocera venosa Fowler—det. Muir

(as sp. on *Palicourea cracea*) Stevenson 18-218: host of *Isaria saussurci* Cooke.

(as sp.) Smyth 19-146: on *Citrus* spp., *Palicourea* spp., *Anona* spp., *Piper aduncum*, sugar cane rarely; also from Vieques Island.

Wolcott 21-19: rare on cane, common on wild orange at Pt. Cangrejos.

Wolcott 24-32: eaten by *Anolis cristatellus*.

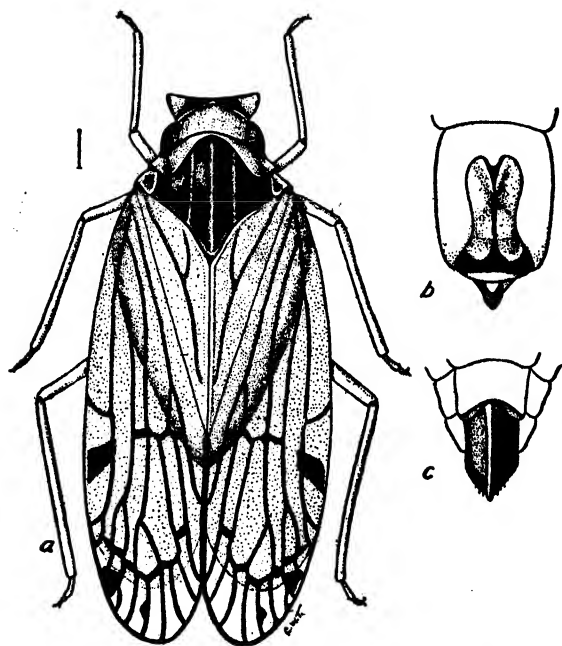
Dozier 31-14: common on coffee.

Osborn 29-106: "taken at a great many localities in a variety of habitats from mangrove association in salt flats to mountain roadsides."

Osborn 35-196, fig. 45: quoting description; nymphs probably live underground.

AMC: at Luquillo vii-32, Caguas xii-29, Algarrobo ii-31, Ponce viii-30, Utuado xii-30, Añasco x-30, Cabo Rojo xi-30, San Germán iv-31, and on nine dates at Mayagüez.

(294-12, 618-16, 824-16), at light (149-17), on grapefruit (809-16, 33-20, 66-20); on *Banisteria laurifolia* at Martín Peña (843-14); on *Inga vera* at Añasco (341-13); on *Inga laurina* at Lares (147-22); common on coffee at Corozal, Ciales, Lares and Yauco (291-21) at Adjuntas (I No. 2248);



Bothriocera venosa Fowler: *b*, male & *c*, female genitalia. Fifteen times natural size. (After Osborn.)

nymphs at Ciales, brown with warts on head and thorax and with long iridescent spicules at caudum, and also swept from grass in coffee grove (61-21); on coffee, *Heckeria peltata* and very common on unidentified plant, many killed by fungus, in mountains north of Yauco (84-22); common on sugar-cane at Mayagüez (145-23); on banana at Bayamón (I No. 2175); on sea-grape at Añasco (I No. 2288); on Hibiscus at Mayagüez (I No. 5784).

***Bothriocera bicornis* F.—det. W. L. McAtee**

(I No. 920); resting on banana leaf at Mayagüez (I No. 254); on grapefruit at Añasco (I No. 1218).

***Oliarus franciscanus* Stal**

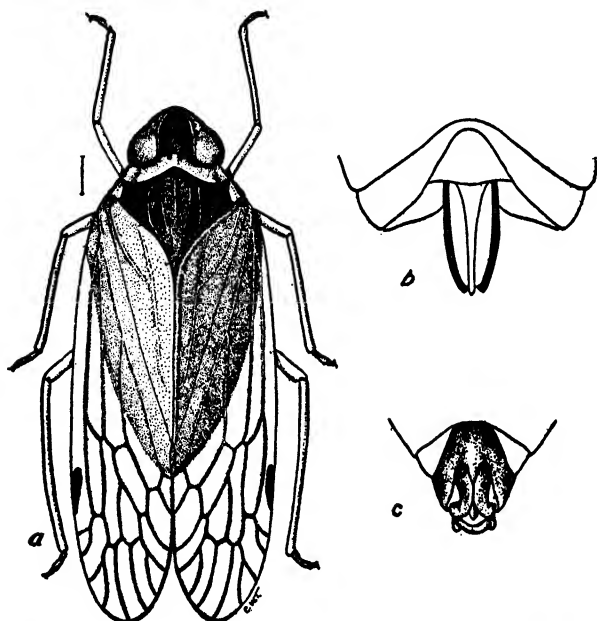
(as sp.) Wetmore 16-66: eaten by Tody, *Todus mexicanus*.

(as sp.) Smyth 19-147: "Cotton-tail plant-hopper—quite common on young cane."

(as *cinereus* sp. nov.) Wolcott 21-18, fig. 4: adults, singly or in coitu, common on cane, especially at Manatí and Sardinera.

(as *cinereus* Wolc.) Tower 22-24: unsuccessfully used in transmission of mosaic disease of sugar-cane experiments.

(as *cinereus*) Wolcott 24-18, 22, 23. 32: eaten by *Anolis pulchellus*, *A. krugii* and *A. cristatellus*.



Oliarus franciscanus Stal: *b*, female & *c*, male genitalia.
Fifteen times natural size. (After Osborn.)

(as *cinereus* Wolc.) Seín 29-90: nymphs reared on the roots of sugar-cane.

Osborn 29-106: synonymy, "generally distributed—in a great variety of habitats."

Seín 32a-1 & 32-5: subterranean nymphs do not transmit mosaic disease of sugar-cane.

Leonard 31-111: used by Seín as attempted vector of mosaic disease of sugar-cane.

EEWI-228: a primary but unimportant pest of sugar-cane, the nymphs on roots.

Osborn 35-197, fig. 46: quoting description.

on carrots (536-17), on beans (205-16), on eggplant (RTC), on tomato (1152-16), on potato at Carolina (I No. 3488); on ñame at Mayagüez (I No. 5839); on asparagus at Cidra (I No. 2893-B); on corn (517-17); on sugar-cane (132-11, 143-11, 661-12), at Toa Baja (445-21, 256-22), at Guánica (40-22); on avocado at Villalba (I No. 2666); constituting 5% of the food of the lizard, *Anolis pulchellus*.

Pintalia alta Osborn 35-200, fig. 47: TYPE from Lares, others from Coamo Springs, Aibonito and El Yunque, P. R.

(as *P. decorata* Uhler) Osborn 29-108: at Lares.

(as "sp. nov." det. P. W. Oman I No. 3044).

Pintalia infusata Osborn 35-199: TYPE and others from El Yunque, P. R.

Pintalia maculata Osborn 35-199: TYPE from El Yunque, P. R.

Pintalia (Cotyleceps) decorata Uhler

Osborn 35-202: quoted description; a specimen from C. U. collection is this species.

Myndus obscurus Uhler—det. W. L. McAtee

on pumpkin at Las Marías (I No. 472); on El Yunque (I No. 5405 as "sp." det. P. W. Oman).

Cubana tortriciformis Muir 24-461: TYPE from El Yunque, P. R.

Osborn 29-106: not since collected

Osborn 35-202: quoting description.

a single specimen on El Yunque, about 3,000 ft. elev., just below the first look-out, at the spring (29-24 TYPE); on Hibiscus at Mayagüez (I No. 5782 as "sp." det. P. W. Oman).

Ladella acunae Metcalf & Bruner

Osborn 35-204: at Coamo Springs.

Ladella pallida Walker

IP-274: on malojillo grass at Río Piedras (March 31, 1920 GNW—det. H. L. Dozier).

Dozier 31-14: at Aibonito, Maricao, Coamo Springs and Mayagüez.

Osborn 35-203: quoted description.

Neurotmeta (Tangia) angustata Uhler

(as *Tangia angustata* Uhler—det. W. L. McAtee) IP-271: on *Inga vera* (83-21); on coffee at Cayey (409-21); on poke-weed, *Phytolacca decandra*, and on *Heckeria peltata* in mountains north of Yauco (313-21); the green nymphs, with brush of widely-diverging, transparent-iridescent spicules at

caudum, reared to adult on coffee (93-21), on *Erythrina glauca* (39-21) by Mr. Seín; on wild orange at Jácome Alto (23-21). (as *Tangia*) Wolcott 24-32: eaten by *Anolis cristatellus*.

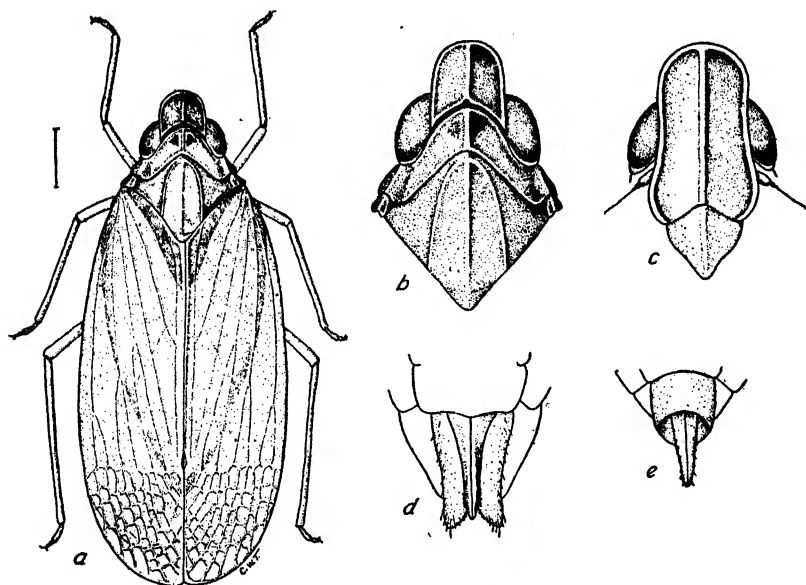
(as *Tangia*) Osborn 29-107: "specimens from *Guilandina crista*, near San Juan, may be referred here."

Osborn 35-205: quoting description and notes.

on "jagüey", *Ficus laevigata*, at Manati (22-24); readily separated from *sponsa* (specimens from Cuba, collected and determined by S. C. Bruner) by the more sharply angled vertex; vertex of *viridis* is rounded but much shorter.

Neurotmeta sponsa Guerin—det. P. W. Oman.

on guava at Aibonito (I No. 4625).



Neurotmeta viridis Walker: *b*, vertex, *c*, face, *d*, female & *e*, male genitalia. Six times natural size. (After Osborn.)

Neurotmeta viridis Walker

(as *Tangia* sp.—smaller) IP-271: on grapefruit at Vega Baja (531-16); on sea-grape, *Coccoloba uvifera*, at Loíza (126-22).

(as *Tangia* sp.) Wolcott 26-49: on sea-grape.

(as *N. sponsa* Guerin) Osborn 29-107: between Cayey and Jácome Alto.

Osborn 35-204, fig. 48: at Aguirre and Salinas.

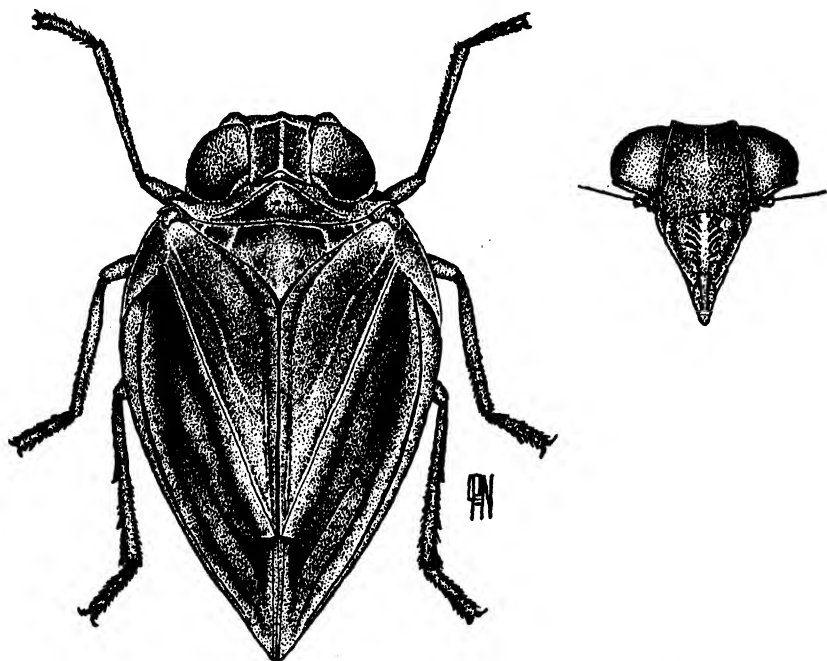
Thionia borinquensis Dozier 31-18, fig. 13: TYPE from Aibonito, P. R.

(as sp.) IP-271: nymphs abundant, and a few adults, on sea-grape, *Coccoloba urifera*, at Loíza (122-22), at Mameyes (340-22).

(as sp.) Wolcott 26-49: on sea-grape.

Osborn 29-108: not collected.

Osborn 35-206, fig. 49: Dozier's description and illustration. at Cidra (I No. 4290), at Adjuntas (I No. 4310).



Thionia borinquensis Dozier. Eleven times natural size.

(Drawn by L. Pierre-Noël.)

Colpoptera brunneus Muir 24-465: TYPE from Utuado, others from Toa Alta and Ciales, P. R.

Osborn 29-108: not collected.

Osborn 35-208: quoted description; specimens from Aibonito and Tallaboa.

on coffee at Utuado. (475-21 TYPE, 452-22), at Corozal, Ciales, Lares, Yauco (288-21 a few adults noted at every point, but never in abundance); in mountains north of Yauco (196-23); swept from carpet grass in coffee grove at Ciales (65-21); on *Heckeria peltata* at Espinosa (105-21); at Adjuntas (I No. 4028); at light at Mayagüez (I No. 2404 Leonard 33-133).

Colpoptera carinata sp. nov. Dozier

Closely allied with *Colpoptera maculifrons* Muir and *C. maculata* Dozier. Distinguished immediately by the very prominent, humped mesonotum with elevated carinae.

General color nearly uniform, rather shiny dark brown to fuscous, the frons and legs slightly lighter. In life, the elytra are more or less covered with a rusty powdery secretion that quickly rubs off.

Vertex transverse, slightly produced beyond the eyes, about twice as wide as the length, anterior margin nearly straight, the posterior slightly and obtusely emarginate; pale on disk, the lateral margins darker. Frons very broad, wide at base adjoining vertex, gradually enlarging to its greatest width just before the vertex, from which point the sides are rounded gradually to the clypeus; a row of prominent pustule-like elevations on each side of the frons. Pronotum rather short, distinctly foveate and mottled in appearance, distinctly produced forwards and obtusely rounded in front, the posterior margin angularly emarginate. Mesonotum convexly humped, the carinae prominently elevated and standing out in a very characteristic manner. Elytra three times as long as the greatest width, distinctly narrowed before the apex where it enlarges decidedly, terminating in a somewhat wedge-shaped manner but with the angles rounded and the hind margin sloping forward and slightly and roundly emarginate; veins numerous and prominent.

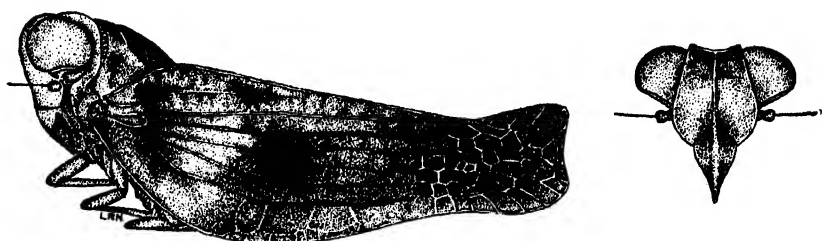
Described from a series of specimens collected at Aibonito, P. R. July 14-17, 1914 (Am. Mus. Nat. Hist. 3707-9); one adult from San Juan, Feb. 14, 1914 (Am. Mus. Nat. Hist. 3438); five adults from Aguirre, February 1925, H. E. Box; one adult on grapefruit from Vega Baja, Aug. 4, 1916, R. T. Cotton (Acc. 530-16); one on bejuco de nasa, *Trichostigma octandra*, from Cayey, Nov. 28, 1922, G. N. Wolcott (Acc. 360-22); two from Vega Baja, Oct. 15, 1924, H. L. Dozier; one from El Yunque, Feb. 17, 1925, H. L. Dozier; and three adults taken on "mangle", *Rhizophora mangle* L. near seashore at Mani Beach, August 11, 1935, H. L. Dozier.

The species is apparently a rather general feeder and occurs at all altitudes from the high mountains to the seashore. Name, description and notes by H. L. Dozier.

Colpoptera maculata Dozier 31-21, fig. 16: TYPE from Guánica, others from Aguirre, Ponce, Juana Díaz, Tallaboa and Maricao, P. R., and from Mona Id.

(as *C. maculifrons* Muir) Osborn 29-108: on "pendula" at Salinas; on sea-grape at Salinas and Cataño; on *Lantana* at Yauco; on *Burita* at Tallaboa.

Osborn 35-209, fig. 50: quoting description and notes.



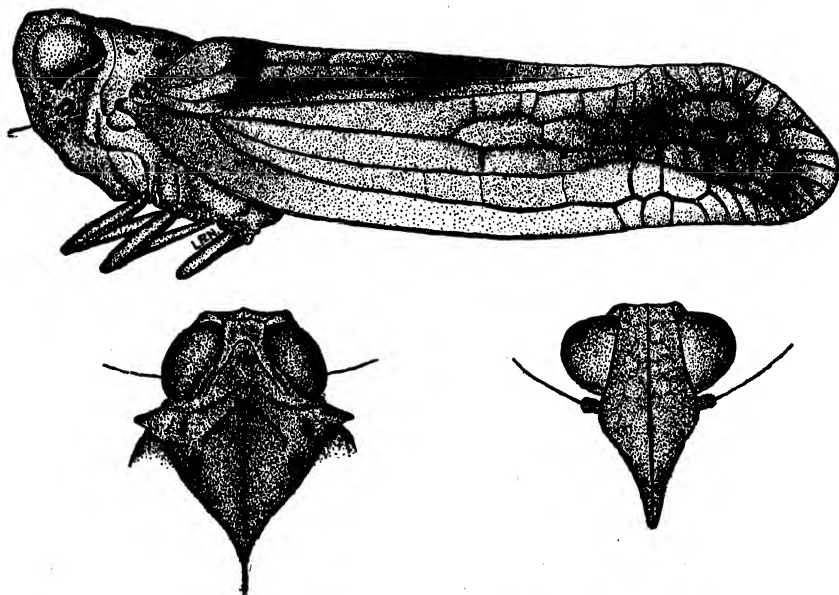
Colpoptera maculata Dozier. Twelve times natural size.
(Drawn by L. Pierre-Noël.)

Colpoptera maculifrons Muir 24-466: TYPE from Río Piedras, P. R., Jan. 10, 1917 (RTC).

(as *Cyarda* sp.) 1P-272 and Wolcott 26-49: on sea-grape at Pt. Cangrejos (397-22 re-determined H. L. Dozier).

Osborn 35-211, fig. 51: quoted description; specimens from Laros.

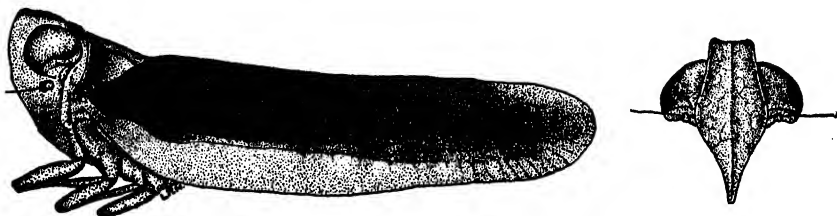
in orange grove at Mayagüez (I No. 4818); on pomarrosa at Bayamón (I No. 2449 Leonard 33-123), at Arecibo (I No. 4945).



Neocolpoptera portoricensis Dozier. Twelve times natural size.
(Drawn by L. Pierre-Noël.)

Neocoloptera portoricensis Dozier 31-22, fig. 17: TYPE from Aibonito, P. R.

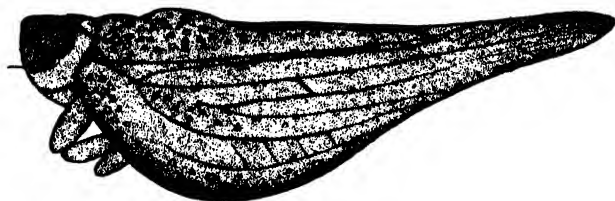
on pomarrosa at Cidra (I No. 2613, 2889); in vine at Arecibo (I No. 2545).



Neocoloptera monticolens Dozier. Eleven times natural size.
(Drawn by L. Pierre-Noël.)

Neocoloptera monticolens Dozier 31-24, fig. 18: TYPE from Aibonito, others from Cayey and El Yunque, P. R.

Osborn 35-212, fig. 52: quoting Dozier.
on guava at Bayamón (I No. 3165).



Rhynchopteryx salina Dozier. (After Dozier.)

Rhynchopteryx salina Dozier, H. L., "A New Fulgorid from Puerto Rico", Jour. N. Y. Ent. Soc., Vol. 35, No. 1, pp. 53-54, fig. 2 New York, 1927: TYPE from "lirio de mar," *Batis maritima*, Ponce and Arroyo, P. R.

Osborn 35-215, figs. 54 & 55: at Ensenada (Guánica) and Mayeyes.

Acanalonia brevifrons Muir 24-467: TYPE from Pt. Cangrejos, P. R. (as *A. sp. nov.*—det. F. Muir, "near *depressa* Melichar") IP-271: on shrub in woods at Seboruco, Laguna de San José (234-23 TYPE).

Osborn 29-108 & 35-217: not since collected.

Aacanalonia coniceps Osborn 29-108: TYPE from Salinas, P. R. Osborn 35-217, fig. 56: quoted description; at Tallaboa.

Acanalonia viriditerminata Lethierry

Dozier 31-13: on El Yunque and at Aibonito.

Osborn 35-217: no additional collections.

Philatis agilis Melichar, L., "Monograph der Acanaloniiden und Platiden (Homoptera)". Ann. des K. K. Natur-histor. Hof-museums. Vols. 16, pp. 178-258, & 17, pp. 1-253, pl. 9. Berlin, 1901-2: on p. 192 (as *Batusa*) TYPE from Portorico.

Osborn 35-218: quoted description, generic transfer; specimens from Naguabo and El Yunque.

Chlorochara vivida F.

Melichar, L., "Genera Insectorum" Fasc. 182, p. 8. Brussels, 1923: "La seule espece du genre habite l'île de Porto Rico."

Osborn 35-219: from Mameyes and El Yunque.

Ormenis infuscata Stal—det. O. Heidemann

Osborn 29-109: "I did not find it in any numbers."

Osborn 35-222: diagnostic notes; at Añasco, Arecibo, Aibonito. all stages on sugar-cane, under and on aguacate (674-12 det. O. Heidemann); adults on grapefruit at Vega Baja (518-16), at Vega Alta (157-15), at Manatí (59-33 & I No. 4715, the same collection, both det. P. W. Oman), at Arecibo (I No. 2154), at Añasco (I No. 1218 Leonard 33-129); on guava at Arecibo (I No. 1783 Leonard 33-116).

Ormenis (Petrusina) marginata Brunnich—det. O. Heidemann

Wolcott 24-12, 32: eaten by *Ameiva exsul* and *Anolis cristatelus*.

Wolcott 26-49: on sea-grape.

Osborn 29-109: on *Lantana* and *Cordia* at Yauco, Aguirre, etc.

Osborn 35-220: "distinguished most readily by the conspicuous white submargin of the elytra"; P. W. Oman's observations that "*marginata* and *pygmaea* merge in coloration and that the males have similar genitalia."

AMC: from fifteen localities.

(128-12); on almendra (I No. 2046 Leonard 33-129); on lime at Ponce (I No. 2245); on citron at Adjuntas (I No. 3126); on sea-grape (138-15), at Añasco (I No. 2290); on coffee at Arecibo (I No. 1987-B), at Utuado (148-20), at Corozal (295-21), at Ponce (I No. 3113); on weeds at Vega Alta (127-17); on ornamental vine at Santa Isabel (183-12, 71-13).

Ormenis (Petrusa) pygmaea F.—det. O. Heidemann

Van Z. (606) on coffee.

Wolcott 24-32: eaten by *Anolis cristatelus*.

Wolcott 26-49: on sea-grape.

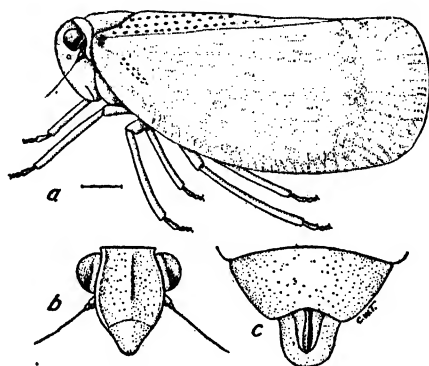
Osborn 29-109: "very abundant on a variety of plants."

Osborn 35-220, fig. 57: notes.

AMC: at ten localities.

(127-12); on *Jasminum pubescens* (268-16), at Mayagüez (I No. 4898)—often a serious pest on jasmin vines and bushes; readily controlled by spraying with nicotine sulfate, 1 to 1,000; on string beans at Manatí (I No. 1300); on yautía at Mayagüez (I No. 4902); on pomarrosa at Corozal (I No. 2197

Leonard 33-123); on *Cordia corymbosa* (273-12), on coffee (173-21, 14-22 reared, eggs laid Sept. 1, 1921, hatched Sept. 12, first adult noted Dec. 1, fifteen on Jan. 15, 1922, one adult lived nearly a year), at Utuado (149-20, 138-20), at Arecibo (I No. 1987); on *Piper medium* at Vega Alta (128-17); on ornamental vine at Santa Isabel (71-13, 183-12); on sea-grape, *Coccoloba uvifera*, at San Juan (138-15, 129-15), at Pt. Salinas (232-16), at Añasco (I No. 2289); on *Lantana camara* at Carolina (51-15); on sea-grape and very abundant on *Lantana camara* at Isabela and Hatillo (206-21); at light at Guánica (664-13) and on *Cordia cylindrostacha* (522-13, 293-16); on guava at Arecibo (I No. 1925 Leonard 33-117).



Ormenis pygmaea F.: b, face, c, female genitalia. (After Osborn.)

Ormenis pseudomarginata Muir 24-469: TYPE on weeds at Vega Alta, another on coffee at Lares, P. R.

Osborn 29-109 & 35-222: no collections since.

on weeds at Vega Alta (127-17 TYPE); on coffee at Lares (150-20).

Ormenis pruinosa Say—det. W. L. McAtee

on tamarind at Mayagüez (I No. 305).

Ormenis quadripunctata F.—det. F. Muir

(as sp.) Van Dine 13-257 & Smyth 13-147: "found breeding on cane leaves in one instance."

Wolcott 26-49: on sea-grape.

Osborn 29-109: "particularly abundant on 'fiddle wood' ('pendula') trees near Salinas."

Osborn 35-221, fig. 58: notes.

AMC: at ten localities.

all stages on sugar cane (under) and on aguacate tree (674-12 det. O. Heidemann); on *Cordia corymbosa* (273-12); on grapefruit (64-20), at Bayamón (I No. 2170), at Plantaje

(32-16), at Sabana Llana (128-15), at Vega Baja (519-16), at Espinosa (507-17), at Arecibo (I No. 2154); on *Lantana camara* at Martín Peña (841-14), at Mameyes (341-22), at Guánica (GNW—det. Muir); on castor bean at Luquillo (95-16); on sea-grape at Isabela (205-21), at Añasco (I No. 2291); on vine at Manatí (I No. 3758); in coffee at Mayagüez (I No. 5787).

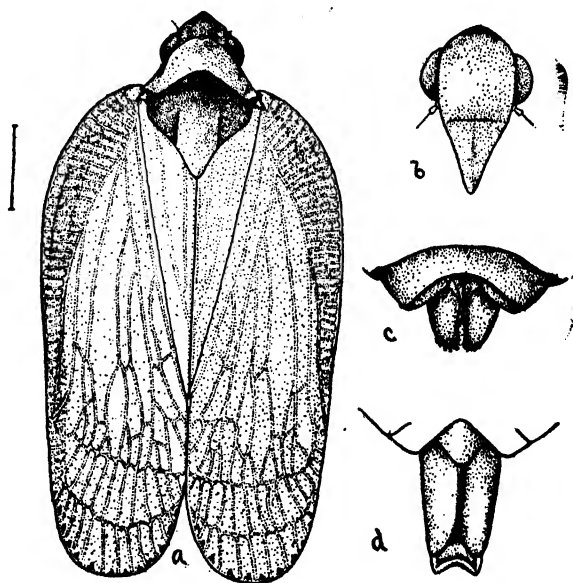
Ormenis spp. (referring to some or all of the above species)

Wetmore 16-66, 71,-----128; eaten by Tody, Hummingbirds, Flycatcher, Pewee, Cliff Swallow, Vireos, Redstart, five Warblers, Honey Creeper, Mozambique and Grasshopper Sparrow. Wolcott 24-26: eaten by *Anolis stratulus*.

EEWI-322: life-history, parasites and predators; control as a pest of coffee.

Ormenis roscida Germar

Osborn 35-223: at Aibonito.



Flatoides punctata Walker: b, face, c, female & d, male genitalia. (After Osborn.)

Flatoides punctata Walker

(as spp.) Osborn 29-109: on tree trunks.

(as sp.) Wolcott 26-49: on sea-grape.

Osborn 35-223, fig. 59: description, on fiddlewood at Salinas. on sea-grape at Isabela (204-21).

Flatoides angulifera Osborn 35-225: TYPE from Aibonito, P. R. (RTC).

at light (321-22); on coffee at Aibonito (RTC TYPE).

Flatoides brunneus Muir—det. P. W. Oman

on *Inga laurina* at Mayagüez (I No. 5833 as sp.), at Maricao (406-21); on *Inga vera* at Aibonito (I No. 4624).

Cedusa edentula Van Duzee

Osborn 29-107: at Añasco.

Cedusa santaclara Myers.

(as *C. inflata* Ball ?) Osborn 29-106: at Añasco.

Osborn 35-227: quoting description and correcting misidentification.

(as sp.) on maga at Arecibo (I No. 5051).

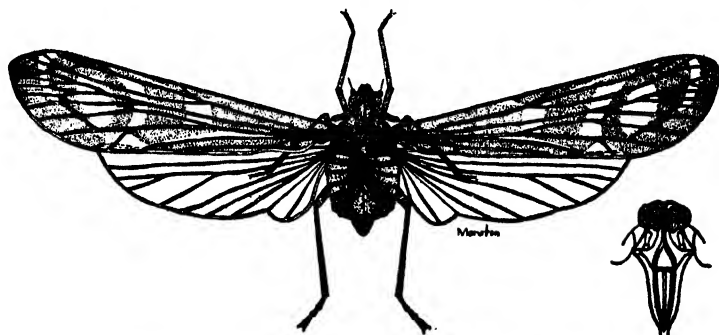
Cedusa wolcottii Muir 24-462: TYPE from Yauco, P. R., feeding on palm.

Osborn 29-107 & 35-227: not collected since.

very abundant on unknown palm in mountains north of Yauco (236-22 TYPE).

Phaciocephalus cubanus Myers

Osborn 35-229: quoted description; at Añasco.



Dawnarioides musae Dozier. Nine times natural size.
(After Dozier.)

Dawnarioides musae Dozier, H. L., "A New Genus and Species of Derbid from Porto Rico", Amer. Mus. Novitates No. 371, pp. 2, fig. 1. New York, Sept. 26, 1929: TYPE from Comerío, P. R., "from under surface of banana leaves".

Osborn 35-230: "not encountered".

Patara albida Westwood—det. P. W. Oman

Osborn 35-231: at Bayamón.

on *Annona diversifolia* (I No. 2414); on mamey at Barceloneta (I No. 4018 Leonard 33-118); on grapefruit at Dorado (I No. 4925).

Cyklokara sordidulum Muir 18-416: TYPE from Aibonito, P. R.
Osborn 35-231: quoting description.

Dysimia maculata Muir 24-462: TYPE from Río Piedras, P. R.
Osborn 35-232: quoting description.
swarms of moth-like Fulgorids, holding their wings extended horizontally like dragon-flies, at base of large *Inga vera* and *Inga laurina* trees (279-23 TYPE).

Otiocerus schonherri Stal, C., "Novæ quædam Fulgorinorum formæ speciesque insigniores descriptæ". Berliner Ent. Zeitsch., Vol. 3, pp. 313-328. Berlin, 1859: TYPE from P. R.
Muir 18-420: from Aibonito.
Osborn 35-233: quoting description and re-description.

Copicerus irroratus Schwarz
Osborn 29-110: at Añasco. Osborn 35-235, fig. 62:

Ugyops granulata Osborn 35-237, fig. 63: TYPE from El Yunque, P. R.

Ugyops occidentalis Muir 18-425: TYPE from Aibonito, P. R.
(as "sp."—det. F. Muir) 1P-272: on trunk of *Inga laurina* at Lares (639-21, 108-22), at Adjuntas (271-22); on trunk of coffee tree in mountains north of Yauco (238-22).
Dozier 31-15: at Naranjito and Aibonito.
Osborn 35-236: quoting description and records.
on El Yunque (I No. 5406 det. P. W. Oman).

Punana puertoricensis Muir 18-425: TYPE from Aibonito, others from Coamo Springs and Mayagüez, P. R.
Osborn 35-238: quoting description.
on guava at Aibonito (I No. 4353 det. P. W. Oman).

Stobaera tricarinata Say
Osborn 29-110 & 35-239: at Aguirre.

Neomalaxa flava Muir 18-426: TYPE from Mayagüez, P. R.
1P-273: on cohitre grass, *Commelina elegans*, at Ciales (278-21), at Lares, and generally in the mountains. The nymphs produce five long filaments from the caudum, besides many smaller ones, and fine threads from the thorax.
Muir & Giffard 24-9: Osborn 29-110: Osborn 35-239:

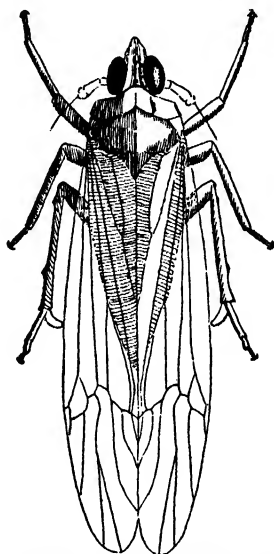
Peregrinus maidis Ashmead—det. O. Heidemann
Jones 15-2: or corn. Cotton 18-291: life-history and control.
EEP-42: "El Peregrino del Maiz."
Osborn 29-110: at Ensenada, Tallaboa, Ciales.
EEWI-246: an economic account.
Osborn 35-240: quoting description and notes.
AMC: at Río Piedras vi-17, Santa Isabel ii-13, Mayagüez ii-23, xi-30.

all stages on corn (532-12, 278-16, 446-17, 42-20), at Loíza (I No. 2184), at Barceloneta (I No. 3214), at Ponce (I No. 3234), a common and rather serious pest; a single adult from leaf of sugar-cane at Santa Isabel (72-13); swept from weeds (I No. 2590, 2591), at Adjuntas (I No. 4010).

Megamelanus elongatus Ball

Osborn 29-110: "on beach grass near San Juan."

Osborn 35-241, fig. 64: quoting description and notes.



Saccharosydne saccharivora

Westwood. Twelve times
natural size. (Drawn by
G. N. Wolecott.)

Saccharosydne saccharivora Westwood

(as *Delphax*) Van Dine 12-20 to 22: on sugar cane, early references, collections in Porto Rico, life history and parasites.

(as *Delphax*) Van Dine 13-256; Van Dine 13-32; Van Z. (309) on sugar cane.

(as *Stenocranus*) Smyth 19-147: on sugar cane.

(as *Delphax*) Jones 14-463: eggs parasitized by a Mymarid, identified as *Anagris armatus* Ashmead by Mr. Girault.

(as *Stenocranus*) Pierce, W. Dwight, in Proc. Ent. Soc. Washington, Vol. 16, No. 3, Sept. 1914, p. 126: host of a new genus and a new species of Strepsiptera, *Stenocranophilus quadratus*.

(as *Delphax*) Wolecott 21-14, fig. 2: life history and abundance. Illustration of adult and nymph.

(as *Stenocranus* (*Delphax*)) Tower 22-24: unsuccessfully used in mosaic disease of sugar cane transmission experiments.

Ritchie, A. H., "Report of the Government Entomologist for the year 1916-17." Suppl. Jamaica Gazette, Kingston, Vol. 40, No. 4, pp. 92-97. Kingston, 1917: effectively controlled in P. R. by parasites.

(as *Delphax*) Earle 28-184: an economic account.

Osborn 29-110: "at no time --- in great numbers on cane, (but) at different times on grasses, sometimes at points quite distant from cane fields."

EEWI-227: scarcity in P. R. due to numerous parasites.

on sugar cane (123-11, 141-11, 974-13, 165-19, 242-19, 157-21), at Luquillo (196-13), at Arecibo (186-11), at San Sebastián (21-22), at Guánica (238-11), thruout the Island but rare on south side.

Sogata approximata Crawford—det. F. Muir

Osborn 29-111 & 35-245: not collected.

on malojillo grass at Pt. Cangrejos (GNW); on grasses in cane fields at Toa Baja (447-21); on squash (I No. 3519-13).

Sogata aurantii Crawford

Osborn 35-244: quoting description and giving the following record.

on Guinea grass, attended by *Solenopsis geminata* F., both nymphs and adults present (107-12).

Sogata cubana Crawford—det. F. Muir

(as *Perkinsiella* sp. "White-lined plant-hopper") Smyth 19-148: on sugar cane, rice and grasses.

(as *Megamelus flavolineatus* Muir) Wolcott 21-18, fig. 3: on sugar cane, both nymphs and adults.

Muir 24-12: at Patillas and Guayanilla on sugar-cane.

Wolcott 24-23: eaten by *Anolis pulchellus*.

Osborn 29-111: at Río Piedras and between Cayey and Jájome Alto. Osborn 35-243: quoting previous records.

AMC: at Río Piedras vii-17.

on rice (41-20), on carrots (573-17, 535-17); on sugar cane at Toa Baja (286-21, 446-21); on beans at Aibonito (I No. 2924).

Sogata cubana* var. *pallida Osborn 35-243: from grass at Fortuna, P. R.

Sogata furcifera Horv.—det. P. W. Oman

on grass at Bayamón (I No. 2980, 3971); on Lantana at Loíza (I No. 5140).

Sogata parvula Osborn 35-244, fig. 66: quoting description of female (from Cuba); male here described from Arecibo, P. R.

Liburniella fasciatella Osborn 35-246, fig. 67: TYPE from between Cayey and Jájome Alto on grass, another at San Juan, P. R., on beach grass.

Pissonotus albovenosus Osborn 35-247, fig. 68: (TYPE from Louisiana), another from Río Piedras, P. R., validating Dozier's MS name.

(as *P. a.* Dozier) Osborn 29-110: at Río Piedras.



Pissonotus albovenosus Osborn.

Twelve times natural size.

(Drawn by H. L.

Dozier.)

Delphacodes albolineosa Fowler

Osborn 29-111: at Río Piedras.

Delphacodes andromeda Van Duzee

Osborn 29-111: at Patillas and Lares.

Osborn 35-254, fig. 71: redescribed.

Delphacodes detecta Van Duzee

Osborn 35-253: at Lares and Río Piedras.

Delphacodes havanensis Crawford—det. F. Muir

IP-273: on malojillo grass at Pt. Cangrejos (GNW).

Osborn 29-111 & 35-252: quoting this record.

Delphacodes humilis Van Duzee—det. F. Muir

IP-274: on malojillo grass at Pt. Cangrejos (GNW); on guinea grass (107-12, 444-12 det. as "near *humilis*" by O. Heide-
mann).

(as sp.) Wolcott 24-22, 23: eaten by *Anolis pulchellus* and *A. krugi*.

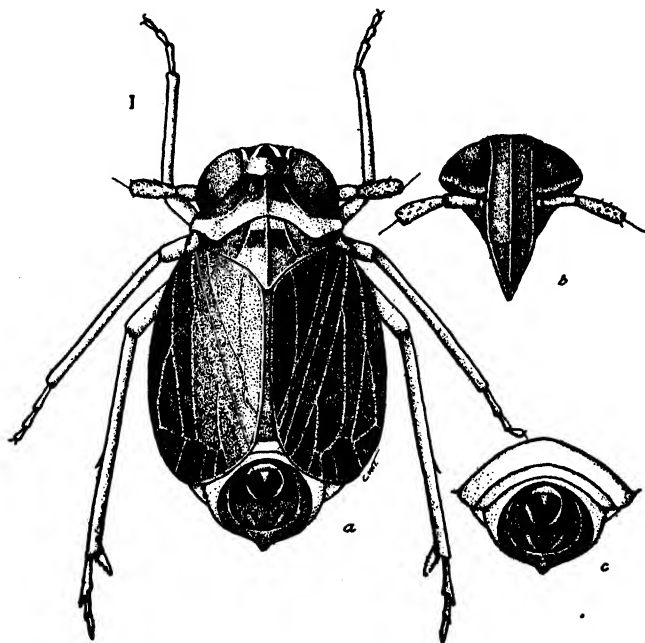
Osborn 29-111 & 35-251, fig. 69: "at numerous points."

Delphacodes lutulenta Van Duzee

Osborn 29-112 & 35-253: at Río Piedras, Mayagüez, Aguirre and between Cayey and Jájome Alto.

Delphacodes nigripennis Crawford

Osborn 35-253, fig. 70: at Salinas, Añasco and between Cayey and Jájome Alto.



Delphacodes nigripennis Crawford: *b*, face, *c*, male genitalia. Twenty times natural size. (After Osborn.)

Delphacodes pellucida F.

Osborn 35-248: at Río Piedras.

Delphacodes propinqua Fieber—det. F. Muir

IP-274: on malojoillo grass at Pt. Cangrejos (GNW).

Osborn 29-111 & 35-249: at Río Piedras, Mayagüez, Fortuna and Aguirre.

Delphacodes puella Van Duzee

Osborn 29-111 & 35-250: at Aguirre and Añasco.

Delphacodes teapae Fowler—det. F. Muir

(as *Liburnia*) Wolcott 21-18: at light, on sugar-cane, on malojoillo and carpet grasses.

Wolcott 24-22, 23: eaten by *Anolis pulchellus* and *A. krugii*.

Osborn 29-111 & 35-250: "most abundantly on grasses."

on carrots (542-17, 576-17); on carpet grass, *Axonopus compressus*, in coffee grove at Ciales (66-21); on malojoillo and Bermuda grasses at Mayagüez (38-23, I No. 4560, 4821, 5786); on *Crotalaria* at Naguabo (I No. 2441 Leonard 33-114); on squash (I No. 3519), at Aibonito (I No. 2935).

- Nilaparvata wolcottii** Muir & Giffard 24-17: TYPE from Pt. Cangrejos, another on sugar-cane at Barceloneta, P. R.
 (as *N. w.* Muir MS) IP-273: on malojillo grass at Pt. Cangrejos (GNW).
 Osborn 29-111 & 35-255: quoting description and records.
 on malojillo grass at Bayamón (I No. 2983).

CHERMIDÆ (PSYLLIDÆ)

- Psyllia minuticonica** Crawford—det. W. L. McAtee
 Wolcott 24-15, 34: eaten by *Anolis evermanni* and *A. gundlachi*.
 at light at Bayamón (I No. 2400 Leonard 33-133); common on *Inga vera* at Lares (163-22), in mountains north of Yauco (203-23), at Adjuntas (I No. 2248, 3994-B), and thruout the coffee districts.
- Aphalara** sp.—det. P. W. Oman
 at Trujillo Alto (I No. 5447).
- Euphalerus nidifex** Schwarz—det. W. L. McAtee
 adults on watershoots of *Ichthyomethia (Piscidia) piscipula*
 at Pt. Cangrejos (300-23), at Yauco (324-23); whitish nymphal skins common on host at Boquerón and Pt. Cangrejos (GNW).
- Heteropsylla mimosa** Crawford—det. W. L. McAtee
 very abundant on *Acacia farnesiana* at Guánica and Guayanilla (GNW), at Guánica (103-13).
- undetermined Psyllids on *Pithecolobium saman* (431-16).

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- Jones, Thos. H.**, "Aphides or Plant-Lice Attacking Sugar Cane in Porto Rico". Bull. No. 11, Insular Expt. Station, Río Piedras, pp. 19, pl. 2. San Juan, March 5, 1915.
- Wolcott, G. N.**, "Afidos de Importancia Económica en Puerto Rico". Circ. No. 59, Est. Experimental Insular, Río Piedras, pp. 11, fig. 9. San Juan, 1922.
- Nolla, J. A. B.**, "*Acrostalagmus aphidum* Oud. and Aphid Control". Jour. Dept. Agr. P. R., Vol. 13, No. 2, pp. 59-72, pl. 2, ref. 6. San Juan, June 1929.
- Sipha flava** Forbes—det. Monell & Davis
 (as *S. graminis* Ktl.) Van Dine 13-257; Van Dine 13-32: on sugar cane.
 Jones 14-462; Smyth 19-148; Van Z. (307), on sugar cane.
 Jones 15-3: an extended account, giving predators and parasites.

Johnson 15-10; Stevenson 18-207: host of *Acrostalagmus albus* Pr.

Wolcott 21-33; Wolcott 22-4: notes, on sugar cane.

Smyth 19-103; Wolcott 21-47 (after Smyth); Tower 22-25: unsuccessfully used in transmission of mosaic disease of sugar cane experiments.

Van Zwaluwenburg 18-28: "a serious outbreak on young cane at Ponce."

Smyth 19-122: "a severe outbreak at Río Piedras and at Fortuna."

EEL-37: "El Afido Amarillo"; an economic account.

Menéndez Ramos, R. "El Pulgón Amarillo de la Caña." Rev. Agr. P. R., Vol. 11, No. 4, pp. 219-223, fig. 2. San Juan, 1923.

Hernández, Elias, "Represión del Pulgón Amarillo de la Caña". Rev. Agr. P. R., Vol. 14, No. 6, pp. 358-360. San Juan, 1925.

Wolcott 24-101: used by F. Seín in mosaic disease transmission experiments.

Dozier 26-117: a severe outbreak on Uba cane at Villalba in September 1924 dusted with 3% nicotine dust.

Earle 28-182: notes.

Seín 29-91: does not transmit mosaic disease of sugar-cane.

Nolla 29-65: host of *Acrostalagmus aphidum*.

Leonard 31-115: an outbreak at Aguirre controlled by lady-beetles.

Hottes, F. C., & Frison, T. H., "The Plant-Ice, or Aphidæ, of Illinois". Bull. Nat. Hist. Survey Illinois, Vol. 19, Art. 3., pp. 121-447, pl. 10, fig. 50, 14 pp. ref. Urbana, September 1931: on p. 174 mentioned as frequently being a serious pest of young cane in P. R.

Leonard 32-139 & 33-126: locality records and varieties attacked.

Leonard 33-294: *Cycloneda sanguinea* predaceous upon.

Seín 32-1 to 6: reasons why *Sipha flava* can not transmit mosaic disease of sugar-cane.

Wolcott 33-267: mass infestations due to planting Uba and Java canes, from which aphids spread to other varieties.

EEWI-231 to 233: an economic account.

on sugar cane (328-12, 925-13), at Guánica (166-11, 515-13, 342-13), at Trujillo Alto (722-12), at Juncos (27-19), common on this host, sometimes occurring in such abundance over entire fields of young cane as to cause serious injury before the many predators and parasites can bring it under control: on sorghum (498-13), on lemon grass, *Andropogon nardus cerifer* (347-13).

Aphis gossypii Glover

Barrett 05-396: on cotton. Smyth 20-124: on cotton.

Jones 15-3: on cucumber, predators and parasitic insects and fungi mentioned.

Cotton 18-294: on cucumber, control by spraying.

Wolecott 22-4: on cotton and melon.

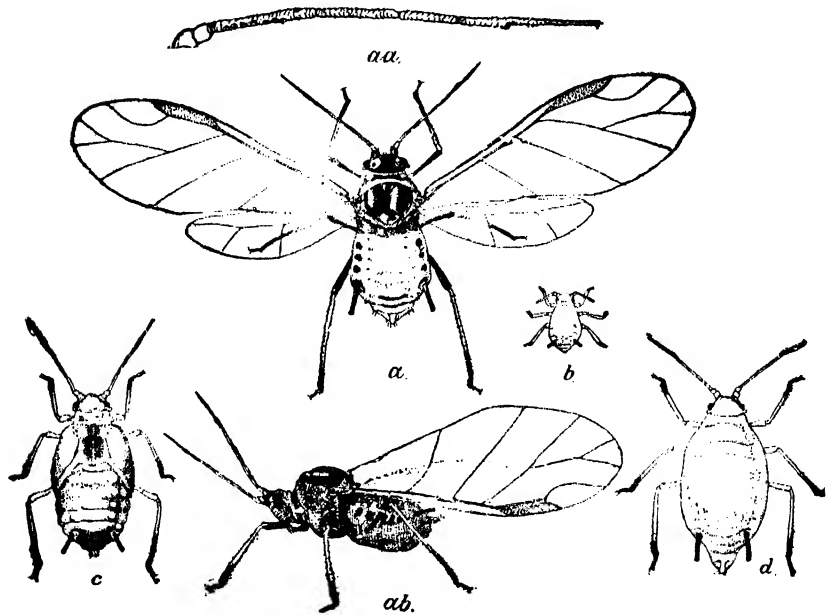
(as sp.) Stevenson 18-207: host of *Acrostalagmus albus* Pr.

EEP-64, 118: on cotton, a serious pest on cucumbers.

Nolla 29-65: host of *Acrostalagmus aphium*.

Leonard 31-118, 32-130, 132 & 33-144: on eggplant, cotton and cucumber.

on *Psidium guajara* (64-23 det. Baker), on cucumber (394-12 det. Pergande, 43-16): very destructive to honey-dew melons at Condado near the beach, but controlled by spraying when the plants were young (Lee H. Vendig); on cotton (595-16, 423-21 det. Baker), at Sabana Grande (357-21), at Isa-



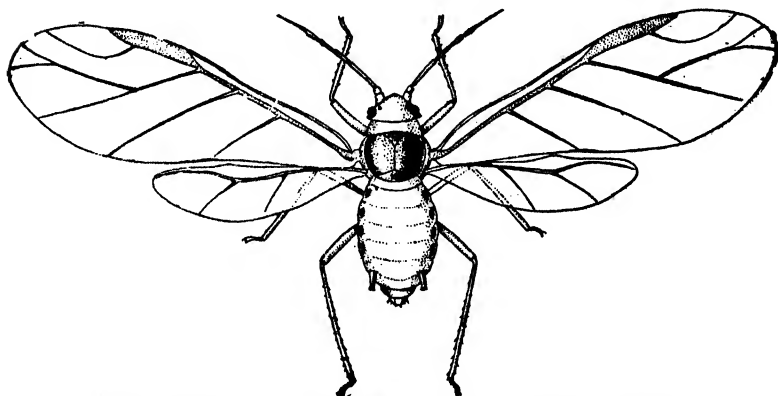
Aphis gossypii Glover: a. winged female; aa. antenna of same, greatly enlarged; ab. dark female from the side; b. small nymph; c. fully-grown nymph; d. wingless female. (After Chittenden.)

bela and Hatillo (137-21) "most abundant on fields just behind sand dunes and close to the ocean, and even in these fields, only a small number of plants were heavily infested; attended by *Prenolepis longicornis* Latr. and furnishing food for several species of predators"; on *Cecropia peltata* at Lares (97-22 det. Baker); on cucumber (I No. 1267), at Loíza (I No. 1386), at Caguas (I No. 1776); on watermelon (I No. 1756), at Arecibo (I No. 1221); on cassava melon at Loíza (I No. 1531, 1860); on eggplant (I No. 1278), at Palo Seco (I No. 324); on tobacco at Loíza (I No. 5158-D); on okra at Trujillo Alto (I No. 1402 Leonard 32-134 & 33-119);

on panama potato at Juncos (I No. 1777); on almendra at Bayamón (I No. 5354); on leaves and flowers of periwinkle, *Catharanthus roseus*, either transmitting a mosaic, or causing lesions that superficially look like one (6-33 det. P. W. Mason); a few on mango (47-33 det. P. W. Mason); on orange at Juana Díaz (I No. 5192); heavily infesting tender twigs of many young grapefruit trees at Añasco (I No. 1831 det. P. W. Mason).

***Aphis illinoisensis* Shimer**

(as *Macrosiphum i. S. = viticola* Thomas—det. E. Patch) IP-278 & Wolcott 22-6: on *Cissus sicyoides* (162-21, 417-21). Leonard 32-133 & 33-116: on grape at Ponce, on Vieques Id. on grape at Mayagüez (I No. 4815 det. P. W. Mason).



Winged female of *Aphis maidis* Fitch. Greatly enlarged.
(After Webster.)

***Aphis maidis* Fitch**

Cotton 18-291: the corn leaf aphid, notes and control by insect enemies.

Wolcott 21-34: "not found on cane in Porto Rico."

Wolcott 23-45: adults found on young plant cane at Guánica, nearly half of which had mosaic disease two months later.

Chardón, C. E. & Veve R. A., "The Transmission of Sugar-Cane Mosaic by *Aphis maidis* under Field Conditions in Porto Rico" *Phytopathology* Vol. 13, No. 1, pp. 24-29, fig. 1, Lancaster, Penn., January 1923.

- "1. *Aphis maidis* is found, with more or less abundance, in various grasses occurring in the sugar cane fields of Porto Rico.
- "2. After the weeding of the fields, *Aphis maidis* passes to sugar cane plants, living in the central whorl of leaves for a period of time.
- "3. During the short time that it stays on cane, *Aphis maidis* transmits the infective substance of the sugar cane mosaic and carries the disease from diseased to healthy plants."

Chardón 23-65 to 67: the same data.

EEP-43: a pest on corn; role in transmission of mosaic disease of sugar-cane.

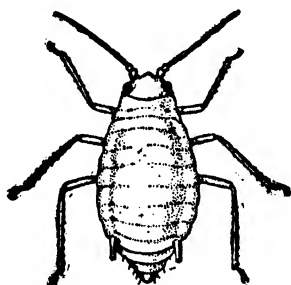
Wolcott 24-18, 22, 32: eaten by *Anolis pulchellus* and *A. cristatus*.

Wolcott 24-57: report on F. Seín's experiments in mosaic disease transmission.

Wolcott 24-101: F. Seín's further experiments.

Chardón, C. E., "La Relación de Ciertas Yerbas con el Matizado de la Caña de Azúcar". Rev. Agr. P. R., Vol. 12, No. 5, pp. 305-314, fig. 6. San Juan, May, 1924: 12.4% of secondary infection in field weeded six times vs. 2.9% in field weeded twice.

Wolcott, G. N., "Increase of Insect Transmitted Plant Disease and Insect Damage through Weed Destruction in Tropical Agriculture". Ecology, Vol. 9, No. 4, pp. 461-466, ref. 3. Brooklyn, N. Y., October 1928: "it can not be too strongly



Apterous female of *Aphis maidis* Fitch. Greatly enlarged. (After Webster.)

emphasized that the rapid spread of this disease is primarily due to the destruction of weeds."

Earle 28-181: a summary of mosaic disease research.

Seín 29-91: mention.

Seín, F., "A New Mechanical Method for Artificially Transmitting Sugar-Cane Mosaic". Jour. Dept. Agr., P. R., Vol. 14, No. 2, pp. 49-68, ref. 21. San Juan, May 1930: the same incubation period (15 days) required as when transmission is by *Aphis maidis*.

Seín, F., "Nuevo Método de Transmitir el Matizado y su Aplicación Práctica". Rev. Agr. P. R., Vol. 25, No. 2, pp. 64-65. San Juan, 1930.

Leonard 31-144: a summary of the experiments by F. Seín.

Seín 32-5: "Does the corn aphid, *Aphis maidis* Fitch, transmit the disease because it feeds on the tender leaves?" No.

EEWI-229: The vector of mosaic eaten by *Anolis pulchellus*.

on corn (273-16 det. Wilson); on sorghum (523-12 "resemble *Aphis avenae*" Monell); on malojillo grass, *Eriochloa subglabra*, from Fajardo (142-22 det. A. C. Baker) in cages used by Chardón & Veve in mosaic transmission experiments; on sugar cane at Bayamón, in central whorl, May 5, 1920 (GNW) "only early stage nymphs present so cannot determine" A. C. Baker; adults on sugar cane at Guánica (420-21 det. E. Patch); constituted a sixth of the food of seven lizards, *Anolis pulchellus*, at Río Piedras (GNW).

Aphis medicaginis Koch—det. P. W. Mason
on Crotalaria at Mayagüez (I No. 5840).

Aphis nerii Fonscolombe
(as *Aphis nerii* Boyer—det. E. Patch) IP-277 and Wolcott 22-4:
on *Asclepias curassavica* and *Calotropis procera*, a large yellow aphid with antennae and legs black, common on the smaller milkweed in the moister sections of the island, and on the giant milkweed in the dryer sections.
at Lares (418-21), at Yanco (104-14).

Aphis rumicis L.—det. P. W. Mason
on *Canavalia maritima* at Pt. Cangrejos (162-32 det. P. W. Mason); on lima beans at Loíza (I No. 1606, 1670), at Vega Baja (I No. 1678); on pigeon peas (I No. 785), at Isabela (I No. 5154); on string beans at Manatí (I No. 1406), at Loíza (I No. 2036); on Lantana at Arecibo (I No. 4973); on sea-grape at Ponce (I No. 2561, 3627).

Aphis spiraeicola Patch—det. P. W. Mason
EEWI-434: recent appearance in P. R.
on grapefruit at Mayagüez, Oct. 23, 1926, S. D. Whitlock (I No. 508), at Río Piedras (161-32), at Palo Seco (31-34), at Comerío (20-34), at Isabela (GNW).

Brevicoryne brassicae L.
(as *Aphis*) Cotton 18-283: on cabbage, control.
EEP-113: a pest on cabbage.
on Chinese mustard (31-18): on cabbage at Villalba (I No. 5084); on broccoli at Villalba (I No. 5175).

Carolinaia cyperi Ainslie—det. A. C. Baker
Wolcott 23-45; Chardón 23-66: on *Cyperus rotundus*, a common sedge in cane fields.
Wolcott 24-101: used by Seín in mosaic disease transmission experiments; negative results.
Nolla 29-66: host of *Acrostalagmus aphidum*.
(421-21), at Bayamón (422-21), at Barceloneta and Arecibo (9-22).

Hysteroneura setariae Thomas—det. J. J. Davis

(as *Aphis*) Jones 15-4: "The Brown Sugar Cane Aphis", not common and occurs in small numbers at the junction of the leaf-sheaths and blades of young cane, covered with sheds of earth built over them by ants, *Solenopsis geminata* Fabr.

(as *Aphis*) Jones 14-462; Smyth 19-148: on sugar cane.

(as *Aphis*) Wolcott 21-34: scarcity on sugar cane, notes.

Wolcott 24-101: used by F. Seín in mosaic disease of sugar-cane transmission experiments.

EEWI-234: scarcity on sugar cane in P. R.

on sugar cane (329-12, 696-12, 92-13, 923-13), at Loíza (DLVanD), at Mameyes (795-12), at Arroyo (DLVanD), at Manatí (GNW); on stems, leaves and spike of wire grass, *Eleusine indica* (289-22 det. A. C. Baker).

Rhopalosiphum nymphaeae L.—det. H. L. Dozier

on water-lily (95-24).

Rhopalosiphum pseudobrassicae Davis—det. P. W. Mason

(as *Aphis*) Nolla 29-66: on cabbage and mustard, as host of *Acrostalagmus aphidum*.

on mustard at Vega Alta (I No. 3270).

Toxoptera aurantiae Koch (= *aurantiae* Boyer)

(as *T. aurantii* Boyer) Van Zwahlenburg 17-516: on young shoots of coffee, orange and "geo"; notes and control by fungus, *Acrostalagmus albus*.

Wolcott 22-6: on mamey, *Mammea americana*, coffee, cacao and *Citrus* spp., illustration of the curling of the leaves of the latter by the aphids.

EEP-57, 68: a pest on coffee, and on citrus.

Wolcott 24-54: abundant on caged coffee in F. Seín's experiments. Wolcott 26-49: on sea-grape.

Nolla 29-65: host of *Acrostalagmus aphidum*.

Leonard 33-119: on "maria", *Calophyllum antillarum*.

EEWI-323, 428, 524: on coffee, citrus and mamey.

on mamey and grapefruit at Plantaje (28-16), on grapefruit (34-16 det. H. F. Wilson), at Trujillo Alto (I No. 346), at Bayamón (I No. 356, 363, 812), at Manatí (I No. 2347), at Arecibo (I No. 2135), on *Murraya (Chalcas) exotica* (134-17 det. H. F. Wilson, I No. 3184); on cacao at Ciales (471-21); on mamey and sea-grape at Pt. Salinas (68-22) attended by *Monomorium destructor* Jerdon; common on coffee at Adjuntas (I No. 2247, 2926), and thruout the Island, eaten by Honey Creeper, *Coereba portoricensis* (153-23) from this host; on mamey at Las Marías (I No. 2108 Leonard 33-118); on mango (47-33 det. P. W. Mason); on jagua (42-25).

Amphorophora lactucae Kaltenbach—det. A. C. Baker

on lettuce (182-19, 61-22); on wild lettuce at Adjuntas (96-22).

Illinoia solanifolii Ashmead—det. P. W. Mason

on pea at Cidra (I No. 1935 Leonard 33-121).

Macrosiphum sp.—det. A. C. Baker

on dandelion (143-22).

Tritogenaphis ambrosiae Thomas—det. P. W. Mason

on lettuce at Villalba (I No. 4878); on gandul pods (I No. 5304-B); on *Pluchea* (I No. 5519).

Tritogenaphis rudebeckiae Fitch—det. P. W. Mason

on Ghillardia (41-33).

Megoura vicae Buckton—det. P. W. Mason

on lima beans (I No. 1934).

Megoura sp. nov.—det. P. W. Mason

on *Dendrobium maschatum* (I No. 2510 Leonard 33-132).

Myzus persicae Sulzer

(as *Aphis*) Stevenson 18-207: host of *Acrostalagmus albus*.

(as *Rhopalosiphum*) Cotton 18-296: on eggplant and peppers.

(as *Rhopalosiphum*) Wolcott 22-5: mention. IP-278:

Leonard 32-132 & 33-115: on eggplant, and on Irish potato.

on eggplant (33-16, 52-16, I No. 1361), at Loíza (I No. 2024), at Humacao (I No. 1361); on peppers (272-16, 422-16, 17-70, I No. 1342 Leonard 33-121), at Loíza (I No. 1859); on potato at Cidra (I No. 1374); on tomato at Loíza (I No. 1617 Leonard 33-124); on sweet potato and sesame (809-19 det. E. G. Smyth).

Pentalonia nigronervosa Cockerell

EEP-106: "El Afido de la Yautía."

EEWI-483: a minor pest on banana.

Leonard 33-129: on waterlily at Santurce (F. Seín) and at San Germán (N. A. Britton).

on cultivated imported Calla (134-22 det. A. C. Baker); abundant on stems of banana and plantain (280-23 det. P. W. Mason); on yautía and malanga (F. Seín).

Prociphilus erigeronensis Thomas—det. P. W. Mason

resting on dahlia leaf at Guaynabo (I No. 3355).

Aleurodaphis sp.—det. P. W. Mason

on coconut palm at Mayagüez (I No. 1189).

Cerataphis lantaniae Boisduval—det. A. C. Baker

(as *Calaphis latariae*) Smyth, E. G., "Plant Inspection and Quarantine Report" Bull. 23, Insular Experiment Station, Río Piedras, P. R., September 1919, p. 61: "a serious pest of ornamental palms at Río Piedras. Twice intercepted on orchids from Venezuela."

EEWI-362: not spreading to coconut palm.

on Chinese fan palm *Livistona* sp. (42-19, 44-19, 61-23); on *Cryptopodium woodfordii* at Santurce (I No. 5926, 1398 Leonard 32-134); on vanilla at Adjuntas (I No. 2533); abundant on dwarf coconut palm from Malaya (79-35), at Mayagüez (H. K. Plank).

COCCIDÆ

- Busck, A.** "Notes on a Brief Trip to Puerto Rico in January and February. 1899," including a "List of the Coccidæ Collected by Mr. A. Busck in Porto Rico", by T. Pergande and T. D. A. Cockerell, pp. 88-93. Bull. 22, new series, Div. Ent. U. S. Dept. Agr., Washington, D.C., 1900.
- Fernald, Mrs. M. E.** "Catalogue of the Coccidæ of the World". Bull. 88, Mass. Agr. Expt. Sta., pp. 360. Amherst, 1903.
- Jones, T. H.** "A List of the Coccidæ of Porto Rico". Jour. Board of Comm. of Agr., P. R., Vol. 1, No. 1, pp. 1-16. San Juan, January 1917.

The section on Coccidæ was originally prepared by Mr. J. D. More. The paper by Mr. Thos. H. Jones, (17-1 to 16) contains all records from the Insular Experiment Station collection up to the date of its publication, but to avoid repetition, all, including the more recent records, are here listed as tho all were original and only when the record given by Mr. Jones has not been found in the accession catalogue of the Station, has it been noted in the reference to his paper. Practically all the determinations for the list given by Mr. Jones were by Mr. E. R. Sasseer and E. W. Rust, but Dr. Harold Morrison and Prof. G. F. Ferris have made most of the recent determinations. In addition, records for an unpublished list by Dr. Hooker, of the Mayagüez Station, have been included.

MONOPHEBINÆ

Crypticerya sp., prob. *C. rosae* R. & H.—det. H. Morrison
on *Casearia aculeata* at Ponce (I No. 2927).

Ioerya montserratensis Riley and Howard

Busck 00-92: on orange at Mayagüez and Bayamón.

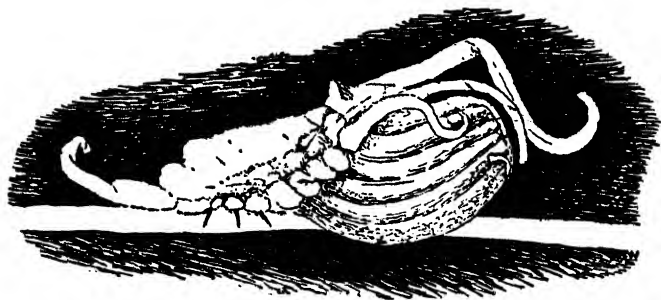
Tower 08-38: on orange.

Van Z. (10): on orange at San Juan; on *Inga vera*, *Inga laurina*, *Byrsonima spicata*, *Casearia sylvestris*, *Cocos nucifera*, *Pithecolobium saman*, and *Psidium guajava*.

Leonard 33-133: on El Yunque.

Wolcott & Seín 33-209 to 214, pl. xvi: a native scale, confused with cottony cushion scale, parasitized by *Rhyssalus brunnei-ventris* Ashmead.

on *Chrysophyllum argenteum* (1204A-13), *Ficus nitida* (37-21), on undetermined tree at Santurce (578-12); on citrus at Dorado (139-16); on *Calophyllum calaba*, at Pt. Can-



Icerya montserratensis Riley & Howard. Five times natural size. (Drawn by G. N. Wolcott.)

grejos (261-16); on *Inga vera* at Ciales (468-21); on *Ficus nitida* at Manatí (351-21), at Caguas (I No. 2164 Leonard 32-141 & 33-130); on grapefruit at Vega Alta (I No. 680), at Las Marias (I No. 2298), at Dorado (146-32); on grapefruit and casuarina at Isabela (7-34), at Barceloneta (I No. 4720, 177-32, 68-33), at Bayamón (130-32); on guava at Lares (I No. 2250).

Icerya purchasi Maskell (introduced) The Cottony Cushion Scale Hoffman, W. A., "*Icerya purchasi* in Puerto Rico". Jour. Ec. Ent., Vol. 25, No. 3, p. 726. Geneva, N. Y., June 1932; on casuarina at Puerta de Tierra.

Leonard 32-138: "lightly infesting 50 rose bushes at Santurce."

Leonard, M. D., "The Cottony Cushion Scale in Puerto Rico." Jour. Ec. Ent., Vol. 25, No. 5, pp. 1103-1107. Geneva, N. Y., October 1932.

Leonard 33-115, 124: on "gallego", *Polysias guilfoylei*, and rose at Santurce.

Wolcott 32-409: after the hurricane of San Ciprián.

EEWI-400: attempt at extermination.

Wolcott, G. N. & Seín, F., "A Year's Experience with the Cottony Cushion Scale in Puerto Rico". Jour. Dept. Agr. P. R., Vol. 17, No. 3, pp. 199-221, pl. 4, ref. 11. San Juan, July 1933.

Wolcott 34-98 to 99: summary of the above.

on rose (I No. 1363 Feb. 24, 1931, det. H. Morrison, the first record for P. R.); on maria (I No. 2333 Leonard 33-119); on pigeon pea at Palo Seco (I No. 2162 Leonard 33-

122); on casuarina (I No. 2172), at Bayamón (I No. 2173), at Dorado (29-34, 146-32); on grapefruit at Bayamón, scarce after hurricane of San Ciprián (153-32), scarce or absent on trees on which previously present (39-34), at Dorado (29-34, 146-32), at Palo Seco (I No. 2161), at Pueblo Viejo (I No. 2805-B), at Humacao (24-34); on Hibiscus at Palo Seco (27-34).

MARGARODINÆ

Margarodes formicarum Guilding

Wetmore 16-50, 61, 119: eaten by Ground Dove, Ani, and Mozambique.

Wolcott 24-3: three individuals in 3 sq. ft. of pasture at Pt. Cangrejos.

Wolcott 24-12: eaten by *Ameiva exsul*.

on roots of grapefruit at Manatí (136-20 det. J. D. More, confirmed by H. Morrison).

ORTHEZIINÆ

Orthezia insignis Douglas

Van Z. (2007): on *Colcus* sp., *Ipomoea fastigiata*, *Lantana camara*, chrysanthemum, tomato, *Hamelia patens* and *Lactuca*.

Jones 17-4: on *Bignonia* sp. and *Ipomoea tiliacea* at Río Piedras.

Wolcott 24-3: fifty-nine individuals on *Mitracarpus* (*Spermacoce*) *portoricensis* in 3 sq. ft. of pasture at Pt. Cangrejos.

Leonard 32-138: on rose.

on *Colcus* sp. (118-16), at Arecibo (I No. 4868); on *Ipomoea tiliacea* at Dorado (736-13 det. Rust); on *Eupatorium odoratum* at Comerío (752-13); on *Lantana camara* at Yauco (702-14); on *Bignonia* sp. and rose-bush cuttings at Aibonito (106-15); on rose geranium at Cataño (I No. 786); at Ponce (I No. 2559).

Orthezia praelonga Douglas—det. H. Morrison

on croton at Bayamón (122-32); on pine at Ponce (I No. 4542); on Bougainvillea at Santurce (75-35).

CONCHASPINÆ

Conchaspis angraeci Cockerell

Van Z. 17-34: on vanilla at Mayagüez. "Not likely to become important."

on branches of an ornamental croton (*Codiaeum* sp.) at Maymes (825-12); on unidentified tree (I No. 1167 Leonard 32-142).

ASTEROLECANIINÆ

Asterolecanium aureum Boisduval

Busck 00-92: on leaves of a fiber plant, at San Juan.

Asterolecanium bambusae Boisduval

Busck 00-92: on bamboo at Bayamón and Utuado.

Van Z. (1613).

on bamboo (758-14, det. E. W. Rust), at Trujillo Alto (37-15), at Cidra (I No. 1187), at Manatí (I No. 115, 1023), at Maricao (I No. 1335), at Mayagüez (I No. 1188).

Asterolecanium lanceolatum Green

on leaves of bambo (758-14 det. E. W. Rust).

Asterolecanium pustulans Cockerell

Busck 00-92: on *Anona muricata* at San Juan, on leguminous plant at Guayama.

Barrett 03-446: on *Ficus carica* at Mayagüez.

Fernald 03-52: Porto Rico.

Van Z. (1635): on rubber, silk-oak, *Anona reticulata*.

Dozier 27-276: host of *Aspidiotiphagus citrinus* Craw.

Dozier 26-97: host of *Mercetiella reticulata* Dozier and *Euaphycus portoricensis* Dozier.

Dozier 26-118: "one of the worst scale pests", on *Cassia fistula*, silver oak or *Grevillea*, Humboldt's willow, oleander, fig. *Alamanda nerifolia*, and guano or *Ochroma lagopus*.

Leonard 33-118, 119, 125: on oleander, mango and silver oak. on silver-oak, *Grevillea* sp. (410-13 det. E. W. Rust), on *Sida antillensis* (801-14), on *Jasminum sambac* (863-14), on *Bauhinia* sp. (1-17), on *Conocarpus erectus* (11-17), on *Bougainvillea* (55-16), on oleander (356-21 det. Wolcott, confirmed by H. Morrison), at Loíza (I No. 2256); on *Cassia fistula* (68-23), at Barceloneta (I No. 4023); on mulberry (526-23); on *Achras sapota* at Vieques Island (421-19); on oleander and ganduls at Pt. Cangrejos (356-21); on cotton at Maunabo (5-22 det. G. F. Ferris); on *Inga vera* at Cayey (6-23); on petioles of leaves and trunk of apple at Bayamón (7-24); on "mirto" at Trujillo Alto (41-25); on maga at Dorado (26-34); on guano (94-24), killing *Cassia simea* (5-34), on *Chalcas (Murraya) exotica* (4-34), rare on flamboyant (GNW).

Asterolecanium sp. nov.—det. H. Morrison

on *Inga vera* at Utuado (31-35).

PSEUDOCOCCINÆ

Oatoni, L. A. "Las Chinchas Harinosas y los Métodos de Combatirlas." Rev. Agr. P. R., Vol. 10, No. 5, pp. 35-37. San Juan, 1923.

Phenacoccus gossypii Townsed & Cockerell

Busck 00-92: on cotton at Humacao, "new to the West Indies".
(as *Phenacoccus helianthi* var. *gossypii*) Maxwell-Lefroy, H. in
"Scale Insects of the West Indies". West Indian Bul., Vol.
III, No. 4, pp. 295-319. Barbados, 1902: on p. 298 "Porto
Rico".

(as sp.) Johnston 15-22; Stevenson 18-134: host of *Empusa
freseni* at Río Piedras.

on *Acalypha wilkesiana* (478-12 det. H. Morrison); on cot-
ton at Maunabo (5-22 det. G. F. Ferris); on tomato at Loíza
(I No. 3867); on gandul pods (I No. 5304-B).

Pseudococcus brevipes Cockerell—det. H. Morrison

Tower, W. V., "Control of the Brown Ant (*Solenopsis geminata*
Fabr.) and the Mealy Bug (*Pseudococcus citri* Risso) in Pine-
apple Plantations". Circ. No. 7, P. R. Agr. Expt. Station,
pp. 3. Mayagüez, 1908. (Reprinted in Wolcott, G. N., "Re-
cent Experiments in the Control of Two Puerto Rican Ants."
Jour. Dept. Agr. P. R., Vol. 17, No. 3, pp. 223-239, ref.
6. San Juan, July 1933: "the method of control there given
is today just as effective and practical as when first devised...
It should be noted, however, that the common mealybug of
pineapples, in Puerto Rico as elsewhere, is *Pseudococcus bre-
vipes* Cockerell.")

(as *P. bromeliæ* Bouché) IP-281: on young bud coming out from
roots of sugar-cane at Guánica (648-21 det. G. F. Ferris);
on roots of *Cyperus rotundus* at Guánica (3-22 det. G. F.
Ferris); on banana rootlets at Corozal (GNW).

(as *P. citri*) EEP-71: as a pest on pineapples.

Faxon & Trotter 32-446: generally distributed.

EEWI-478 to 480: an economic account as a pest of pineapples.

on aerial roots of jagüey, attended by hormiguilla, at Ma-
natí (24-24 det. as *P. bromeliæ* by G. F. Ferris); on pine-
apple at Isabela (105-31 det. H. Morrison—Leonard 32-137),
at Río Piedras (I No. 349, 354), at Bayamón (I No. 372, 374,
377, 393, 414, 701, 943, 2398), at Corozal (I No. 380, 382),
at Vega Baja (I No. 381, 403, 411, 413, 416, 418, 420), at
Manatí (I No. 391, 690); on pomegranate (I No. 740); on
tamarind at Mayagüez (I No. 301).

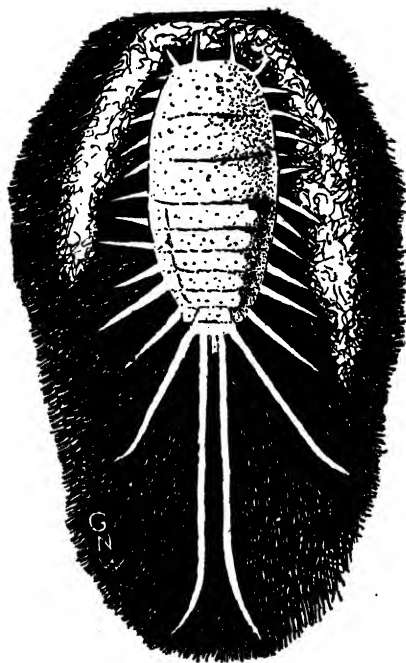
Pseudococcus adonidum L.—det. H. Morrison

(as *P. longispinus* Targioni) Van. Z. (611): on coffee.

Dozier 26-101: host of *Acerophagus nubilipennis* Dozier.

on elephant ear (HLD); on maria, *Calophyllum antillanum*
(I No. 1889 Leonard 33-118); on tree fern at Mayagüez (I
No. 2110 Leonard 33-129); on *Averrhoa carambola* L. (35-

35)—see drawing; on jasmin vine (53-18), at Sabana Llana (313-22 det. G. F. Ferris as *P. longispinus* Targioni); on grapefruit (200-19, 70-20 det. EGS).



Pseudococcus adonidum L. Twelve times natural size. (Drawn by G. N. Wolcott.)

***Pseudococcus boninsis* Kuwana (= *P. calceolariae* Maskell)** The GREY Mealybug of Sugar-Cane (all the records listed below appearing before the publication of the paper by Morrison, H., "Identity of the Mealybug Described as *Dactylopius calceolariae* Maskell." Jour. Agr. Research, Vol. 31, No. 5, pp. 485-500, fig. 6, ref. 16. Washington, D. C., Sept. 1, 1925, use the older name.)

Jones 14-461: first record from Porto Rico.

Johnston 15-14: host of *Aspergillus flavus* at Carolina, Río Piedras, Fajardo, Santa Rita, Guánica.

Johnston 15-25: host of *Isaria* sp. at Río Piedras.

Smyth 19-102: used in transmission of mosaic-disease experiment.

Smyth 19-149: on sugar cane.

Wolcott 22d-17: not eaten under field conditions by introduced lady beetle, *Cryptolacmus montrouzieri* Muls.

Leonard 31 143: mention. Leonard 33-126: on Vieques Id.

Wolcott 34-97: importation of the parasite of *Pseudococcobius* (*Aphyus*) *terryi* Fullaway, from New Orleans, La., but not since recovered, due to scarcity of host.

on internodes of sugar cane behind leaf-sheaths (852-12 det. E. E. Green).

Pseudococcus citri Risso

(as *Dactylopius*) Barrett 03-445: an enemy of citrus stock, not common.

Hooker 12-35, 37: in coffee plantations.

Van Z. (5): on *Ananassa ananas* and orange.

EEP-57, 115: a pest of coffee, and of celery.

Wolcott 24 93, 26-51 & EEWI-317: attended by the hormiguilla on coffee.

Dozier 26-101: host of *Acerophagus nubilipennis* Dozier.

Dozier 27-268, 271, 272: host of *Leptomastix dactylopii* Howard, *Thysanus nigrus* Ashmead and *T. bifasciatus* Ashmead.

Leonard 32-128: on coffee.

EEWI-324: control on coffee seedlings by dipping in lime water.

on the roots of *Apium graveolens* (531-12 det. H. Morrison), *Zea mays* (543-12), and a grass probably *Sporobolus jacquemontii* (554-12), on *Piper* sp. (316-22); on roots of coffee trees at Maricao (408-21 det. H. Morrison); on the tender twigs of coffee trees at Ciales (469-21); on *Heckeria peltata* at Yauco (89-22); in blossom end of large grapefruits at Manati (61-33), quite abundant on leaves, twigs and fruit in grapefruit grove at Palo Seco, June (36-33), a heavy infestation at Isabela (34-35); on guava at Bayamón (1 No. 2073); on panama potato tree at Juncos (1 No. 1784 Leonard 33-120); on maga at Vega Alta (1 No. 5253); on *Solanum* (1 No. 1888); on gandul at Mayagüez (1 No. 676).

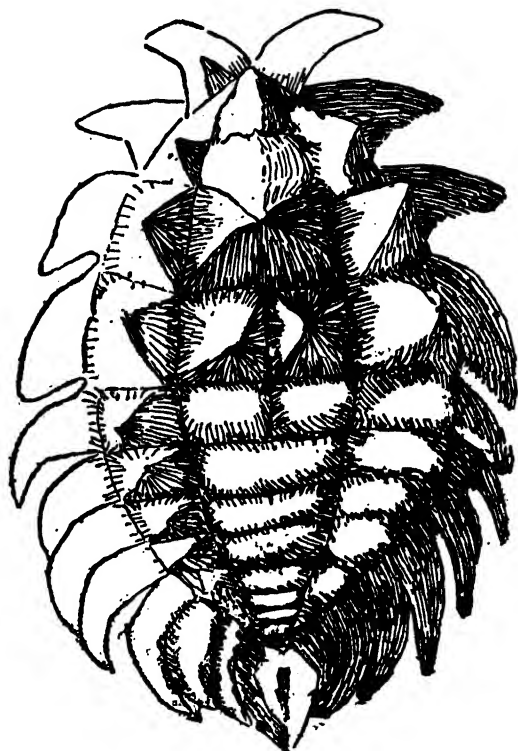
Pseudococcus comstocki Kuwana—det. G. F. Ferris IPSup-431: from stomach of *Anolis pulchellus* at Toa Baja (Lizard No. 306).

Pseudococcus crotonis Green

Sassee, E. R., "Important Foreign Insect Pests Collected on Imported Nursery Stock in 1919." Jour. Ec. Ent., Vol. 13, No. 2, pp. 181-184. Concord, N. H., April, 1920: intercepted on orchid from P. R.

Pseudococcus maritimus Ehrhorn?—det. E. R. Sassee

on pineapple at Vega Baja (1 No. 415), at Campo Alegre (1 No. 385); on tamarind at Mayagüez (1 No. 299).



Pseudococcus nipae Maskell. Twenty times natural size. (Drawn by G. N. Wolcott.)

***Pseudococcus nipae* Maskell**

Johnston 15-19: host of *Cephalosporium lecanii* at Río Piedras.

Johnston 15-21; Stevenson 18-134: host of *Empusa fresenii* at Río Piedras.

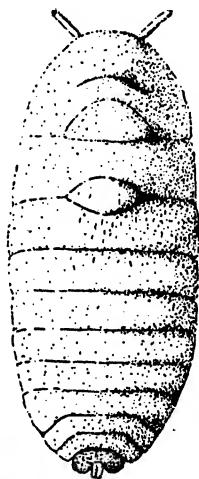
Stevenson 18-207: host of *Botrytis rileyi* at Río Piedras.

Van Z. (1201) on *Persea gratissima* and *Psidium guajava*.

Wolcott 26-49: on sea-grape.

on guava, *Psidium guajava*, (270-12, I No. 1162), at Bayamón (I No. 2073), at Pueblo Viejo (I No. 431), at Vega Baja (I No. 986), at San Sebastián (118-32); on sour-sop, *Annona muricata*, (289-12), at Corozal (I No. 1862), at Ponce (I No. 1743), at Añasco (I No. 2301), at Mayagüez (I No. 83-22), at Maricao (I No. 337); on *Annona reticulata* (12-14); on avocado, *Persea gratissima*, (50-14, I No. 1161), very abundant (17-33), at Mayagüez (I No. 1718); on coconut, *Cocos nucifera*, (120-15 det. E. W. Rust), at Santurce (215-11), at Arecibo (I No. 282-19), at Santa Isabel (427-

13); on Livistona Palm (61-18); on sea-grape at Naguabo (51-14); on *Sterculia apetala* at Salinas (34-35); on *Anthurium acaule* (10-14), on *Chrysophyllum argenteum* (583-12), on banana (585-12), on *Miconia prasina* (235-13), on *Tetrastylis elaeagnoides* (40-14); on *Erythrina glauca* (60-18), on *Achras zapota* on Vieques Id. (423-19); on mamey at Barceloneta (I No. 2260), on carambola tree (35-35 det. H. Morrison).



Trionymus sacchari Cockerell, partly grown female. Twenty times natural size.
(Drawn by G. N. Wolcott.)

Trionymus (Pseudococcus) sacchari Cockerell. The PINK Mealybug of Sugar-Cane.

(as *Dactylopius*) Busck 00-92: on sugar cane at Bayamón, Mayagüez and Humacao.

Fernald 03-109: in Porto Rico.

Van Dine 11-18, 29; Van Dine 12-19, 20; Van Dine 13-251, 252, 253, 255, 256; Van Dine 13-31: on sugar cane.

Jones 14-461: parasitized by *Karschomyia cocci* Felt.

Van Z. (310): on sugar cane.

Stevenson 18-207: host of *Aspergillus flavus* at Río Piedras, Patillas, Fajardo, Carolina and Guánica.

Smyth 19-102: used in transmission of mosaic-disease experiments.

Smyth 19-149: on sugar cane.

Wolcott 22d-17: not eaten under field conditions by *Cryptolaemus montrouzieri* Muls.

EEP-38: an economic account.

Leonard 31-143, 32-140, 33-126: on Vieques Id.

EEWI-237: an economic account.

Wolcott 34-98: host of *Pseudaphycus* sp. nov.

on sugar cane (2-18, 222-19, 225-19); on sugar cane under leaf-sheaths, at Guánica (13-10), at Loíza (20-10), at Vega Alta (61-10), at Pajardo (19-11), at Caguas (3-18), at Guánica (2-22 det. G. F. Ferris), at Vega Baja (I No. 624).

***Pseudococcus (Ferrisia) virgatus* Cockerell**

a severe infestation on grapefruit at Isabela (53-33, 58-33 det. H. Morrison); on ornamental croton (712-17 det. H. Morrison); on *Hibiscus esculentus* (678-17), on *Achyranthes indica* (315-22 det. G. F. Ferris); on almendra at Manatí (290-22 det. G. F. Ferris); on cotton at Vega Baja (5-23 det. G. F. Ferris); on cerezas, *Phyllanthus distichus*, at Samurce (54-33 det. H. Morrison); on lima bean at Loíza (I No. 2032); on asparagus at Palo Seco (I No. 454).

***Pseudococcus* spp.**

Wolcott 24-26, 31: eaten in considerable numbers by *Anolis stratulus* and *A. cristatulus*.

***Antonina (Chaetococcus) bambusae* Maskell**

Van Z. (1614): on bamboo at Mayagüez.

on bamboo, under leaf-sheaths at Mayagüez (82-22 det. G. F. Ferris).

COCCINÆ

***Pulvinaria iceryi* Guerin (= *P. elongata* Newstead).**

Smyth 19-104: first record in Porto Rico, on sugar cane, used in transmission of mosaic disease.

Smyth 19-149: on sugar cane.

Wolcott 21-47: an apparent 6.6% success of transmission of mosaic disease of sugar cane obtained by Smyth.

Wolcott 21-35: on sugar cane.

Dozier, H. L., "An Outbreak of the Red-Striped Scale." Jour. Dept. Agr. P. R., Vol. 9, No. 4, pp. 357-367, fig. 4. San Juan,

October 1925: the most extended account of this scale in P. R.

Dozier 26-119: a less technical account of the above.

Leonard 31-144: summary of the above.

Leonard 32-140: on sugar-cane in the greenhouse.

EEWI-240: based on Dozier's account.

***Pulvinaria psidii* Maskell**

Tower 08-38: on orange and coffee.

Hooker (1250): on *Chrysophyllum cainito*, at Mayagüez.

Van Z. (11): on orange, *Achras sapota* and mango.

Wolcott 22d-111: on *Rauwolfia nitida* at Guánica.

EEWI-408: "one of the main sources of food of the lady-beetle, *Cryptolaemus montrouzieri* Mulsant."

on *Mangifera indica* (530-12); on twigs and petioles of *Citharexylum fruticosum* (62-23); on *Spondias lutea* (545-12, 781-16), at Arroyo (172-12); on *Rauwolfia tetraphylla* at

Ponce (131-13); on *Psidium guajava* (424-12), at Luquillo 922-13), at Lares (I No. 2250 Leonard 33-117), at Villalba (103-31); on coffee at Adjuntas 493-21); on crepe myrtle (36-35).

Pulvinaria urbicola Cockerell—det. H. Morrison
on root of sweet-potato (49-35).

Cryptostigma (Pseudophilippia) inquilina Newstead

(as *Pseudophilippia inquilina*) Newstead, R., in Bull. Ent. Res. 10; 181 (1920): TYPE from Jamaica.

(as *Cryptostigma inga*) Ferris, G. F., in Can. Ent., LIV, No. 7, July 1922, pp. 160-161, fig. 4: TYPE on *Inga laurina* at Lares, Ponce Rico.

(as *Akerones secretus*) Morrison, H., in Psyche, Vol. XXIX, No. 4, August 1922, pp. 145-148, Pl. VI, fig. 20-31: HOLOTYPE and PARATYPES on *Inga laurina* at Mayagüez; PARATYPES on "guama" at San Juan.

(as a pinkish scale), Tower 11-32: in coffee shade trees.
(as a pink scale of the subfamily *Coccinæ*) Hooker 13-35: on *Inga laurina* and coffee.

(as an undetermined pink *Coccus*) Van Zwaluwenburg 14-34; 15-42; 17-515: on *Inga laurina* and coffee.

Wolcott 23-58 and 24-93: in tunnels of "hormiguilla" in *Inga vera* and *Inga laurina*.

Wolcott 26-51: also on *Ficus laevigata*.

EEWI-317: attended by hormiguilla.

in twigs of *Inga laurina* at Lares (6-22 Ferris' TYPE); of *Ficus laevigata* at Manatí (362-23 det. G. F. Ferris).

Ceroplastes ceriferus Anderson

on *Bursera simaruba* at Guánica (234-11 det. E. R. Sasser, 334-13); on *Sauvagesia erecta* at Naguabo (58-14).

Ceroplastes cirripediformis Comstock

Dozier 25-366: on *Ficus*, on Passion flower vine at Bayamón; host of *Aneristus ceroplastae* Howard.

Dozier 27-274: on lignum-vitæ, host of *Plagiomerus cyanea* Ashmead.

on *Myrcia paniculata* at Algarrobo (792-14 det. E. W. Rust).

Ceroplastes cistudiformis Townsend and Cockerell

Van Z. (1631): on *Euphorbia robusta* and *Ipomoea fastigiata*.

Ceroplastes denudatus Cockerell—det. H. Morrison

on *Ficus nekluda*, African cloth bark tree, Muñoz Rivera Park, Puerta de Tierra (26-33).

Ceroplastes floridensis Comstock

Buseck 00-92: on *Anona reticulata*.

Barrett 03-445: on citrus.

Tower 08-38: on rose and orange.

Van Z. (16): on orange, *Psidium guajava*, *Ipomoea* sp., *Mangifera indica* and *Anona reticulata*.

on *Rapanea guianensis* (59-15 det. Rust), on grapefruit (118-15, 164-15), at Pueblo Viejo (I No. 2243), at Isabela (34-35); on *Persea gratissima* (50-18); on *Ficus laevigata* at Yabucoa (139A-16), on *Ficus nitida* at Caguas (I No. 2164 Leonard 33-130); on *Laguncularia racemosa* at Fajardo (162-23 det. Morrison), at Isla Grande (I No. 1027); on banana at Arecibo (I No. 5751); on *Genipa americana* at Guayama (I No. 2682).

Vinsonia stellifera Westwood

Busck 00-92: on *Cocos nucifera* at Cataño, Arroyo and Bayamón.

(as sp.) Barrett 03-446, 447: on rose apple (*Jambos jambos*) and coconut.

Van Z. (1214): on *Mangifera indica*, manila hemp, *Musa* sp., *Eugenia jambos*, coconut, *Agave sisalana* and *Psidium guajava* at Mayagüez.

González Ríos, Policarpo, "El Cultivo del Cocotero en Puerto Rico". Circ. No. 35, Estación Exptal. Insular, Río Piedras, pp. 20, fig. 4. San Juan, 1921.

on *Coccoloba laurifolia* (11-14 det. Van Dine), on undetermined plant (236-13), on *Lawsonia inermis* (265-16); on *Cocos nucifera* at Santurce (214-11); on *Eugenia jambos* (437-12), at Mameyes (831-12); on *Mangifera indica* (I No. 1317), at Santa Isabel (397-13); on orchid leaves at Martín Peña (222-16, I No. 1556); on *Achras sapota* (I No. 1421), at Vieques Island (422-19); on grapefruit at Mayagüez (I No. 3964); on mangosteen (I No. 1539).

Inglisia vitrae Cockerell

Jones 17-7: on *Cajanus indicus* at Mameyes and Comerio.

on *Bixa orellana* (35-14); on *Inga vera* at Guayama (380-21 det. H. Morrison).

Eucalymnatus tessellatus Signoret—det. G. B. Merrill

Berger, E. W., "Natural Enemies of Scale Insects and Whiteflies in Florida". Quart. Bull. Florida State Plant Board, Vol. 5, No. 3, pp. 141-154, fig. 10. Gainesville, April 1921: *Aschersonia cubensis* infesting, on mango from P. R.

Dozier 25-367 & 26-118: on *Calophyllum antillarum*; host of *Aneristus ceroplastae* Howard.

on malay apple, *Jambos malaccensis*, at Trujillo Alto (I No. 1757 Leonard 33-118); on *Calophyllum antillarum* (I No. 1890 Leonard 33-118); on palm (I No. 1891 Leonard 33-119).

Coccus accuminatus Signoret—det. H. Morrison

on malay apple at Trujillo Alto (I No. 1738 Leonard 33-118); on pomarrosa at Corozal (I No. 1861 Leonard 33-122).

Coccus hesperidum L.—det. E. W. Rust

Dozier 26-118: controlled by *Coccophagus lunulatus* Howard.
on maguey (2-15), at Trujillo Alto (92-16); on grosella,
Phyllanthus distichus (54-33 det. H. Morrison); on banana at
Arecibo (I No. 5753); ? on orange at Adjuntas (I No. 2199).

Coccus mangiferae Green

Van Z. (1215): on *Solanum* sp., *Cinnamomum zeylanicum*, *Mangifera indica* and *Artocarpus communis*.

Johnston 15-19: host of *Cephalosporium lecanii* at Río Piedras.
Stevenson 18-207: host of *Botrytis rileyi* at Río Piedras.

on *Eugenia jambos* (43712), on *Blighia sapida* (223-16);
on *Nectandria* sp., at Plantaje (27-16).

Coccus viridis Green

McClelland, T. B. & Tucker, C. M., "Green Scale, *Coccus viridis*, a New Pest in Coffee and Citrus". Agr. Notes, No. 48, P. R. Agr. Expt. Station, Mayagüez, pp. 2. San Juan, July 1929: on coffee at Villalba in 1927, later on coffee at Lares, Maricao, Mayagüez, Lares and Luquillo; on grapefruit, lime and guava at Pueblo Viejo, Guánica and Vega Baja; attacked by *Cephalosporium lecanii* Zimm., for the dissemination of which directions are given.

Leonard 32-125: on grapefruit and coffee.

Wolcott 33-265: abundant during dry weather.

Wolcott & Seín 33-212: killed by *Cephalosporium lecanii*.

EEWI-327, 407: on coffee, on grapefruit.

first record for P. R., on grapefruit at Manatí, collected by Cooley & Gay, June 19, 1925 (I No. 4), at Pueblo Viejo (I No. 426), Bayamón (I No. 1026), at Trujillo Alto (I No. 2373, 2374), at Manatí (I No. 2360), at Barceloneta (I No. 1455); on orange at Ponce (I No. 1076); on lime at Ponce (I No. 2198), at Manatí (I No. 2379), at Isabela (34-35); on sour orange at Guayama (101-31 det. H. Morrison); on Myer lemon at Isabela (102-31); on guava at Arecibo (I No. 1926 Leonard 33-116); on *Chalcas (Murraya) exotica* at Vega Baja (I No. 1707); on coffee at Ponce (I No. 1949), at Utuado (I No. 1319), at Maricao (I No. 1324), in mountains north of Yauco, a heavy infestation close to 100% controlled by entomogenous fungus (74-33), thruout the coffee regions attended by the "albayalde" (F. Seín).

Saissetia hemisphaerica Targioni

(as *Lecanium*) Busck 00-92: on eggplant at Cataño, on coffee at Caguas.

(as *Lecanium*) Barrett 03-444, 445, 446, 447: on coffee, *Anona muricata*, cassava; probably the most common scale on orange.

(as *Lecanium*) Earle 03-458, 459, 463: on orange and at times abundant and destructive to coffee.

Van Leenhoff 06-46: on coffee.

Tower 07-26; 08-32; 08-23; 11-15: injurious to citrus trees.

Jones 15-4: on eggplant. Illustration, pl. 1, fig. 1.

Johnston 15-19: host of *Cephalosporium lecanii* at Río Piedras. (as *Lecanium* sp.) Wetmore 16-66, 106, 116, 119, 121: eaten by P. R. Tody, Parula Warbler, Oriole, Mozambique and Tanager.

Cotton 18-301: on eggplant. Illustration.

- Stevenson 18-208: host of *Cephalosporium lecanii* at Río Piedras, Espinosa, Bayamón, Vega Baja, Comerío, Sabana Llana. Smyth 19a-126: on *Muraya exotica*.

Van Z. (9): on orange, *Coffea arabica*, *Anona reticulata*, *Antigonum leptopus*, *Solanum scaphothianum* and *Drypetes glauca* at Mayagüez.

EEP-57. 69. 105: on coffee, on citrus, on eggplant.

Wolcott 24-26: eaten by *Anolis stratulus*.

Dozier 25-367: on avocado, host of *Aneristus ceroplastae* Howard.

Leonard 32-128 & 33-121, 127: on coffee, guava, papaya and tamarind.

Wolcott & Seín 33-212: killed by *Cephalosporium lecanii*.

on *Gardenia jasminoides* (291-12, 485-12, 41-19, 45-19, 447-19); on *Eugenia jambos* (437-12), on *Graptophyllum pictum* (586-12, 270-16); on pepper (925A-13, 547-16), at Trujillo Alto (I No. 2004 Leonard 33-122); on *Psychotria* (74-15), on *Palicourea* sp. (76-15), on undetermined plant (77-15), on grapefruit (119-15), at Vega Alta (I No. 74, 2217), at Bayamón (I No. 139), at Palo Seco (I No. 2810); on *Myrcia deflexa* (78-15), on *Momordica charantia* (151-16), on *Lawsonia inermis* (265-16), on *Lagerstroemia indica* (267-16), on coffee (271-16), on *Persea gratissima* (761-19), on undetermined plants (550-12, 234-13); on *Schinus molle* (425-12), at Guánica (229-11); on *Psidium guajava* at Luquillo (476-12), at Manatí (I No. 663), at Juana Díaz (I No. 1380); on *Sida* sp. at Luquillo (474-12); on *Solanum nigrum* var. *americanum* at Luquillo (473-12); on *Zamia integrifolia* at Vega Alta (544-12), at Vega Baja (116-16); on *Thunbergia erecta* (830-12) at Mameyes; on *Rauwolfia tetraphylla* at Ponce (132-13); on *Leptilon canadense* (789-13); on orchid and coffee (50-21) at Ciales; on balsam at Arecibo (11-15); on *Achyranthes indica* on Carolina road (57-15); on *Phoradendron antillanum* at Juana Díaz (71-15); on fern at Bayamón (142-15); on mamey seedling (117-16) at Vega Baja; on cycad (447-19); on coffee (833-12), at Mayagüez (I No. 5810), at Larez (165-20), at Adjuntas (92-22), at Maricao (171-22); on soursop at Maricao (I No. 337); on okra at Trujillo Alto (I No. 1401 Leonard 32-134); on poinsettia at Trujillo Alto (I No. 146); on papaya at Isabela (I No. 1991); on tamarind at Ponce (I No. 2558).

***Saissetia nigra* Nietner**

(as *Lecanium nigrum* var. *depressum* Targ.) Busck 00-92: on *Terminalia catappa* at San Juan; on cotton at San Juan.

Fernald 03-204, 205: from Porto Rico.

Hooker (1653): on *Hura crepitans* and *Euphorbia sanguinea* at Mayagüez.

Wolcott 24-22: eaten by *Anolis pulchellus*.

Leonard 31-120 and 32-130: on cotton.

on *Schinus molle* (287-12), on *Melia azedarach* (554-16), on *Coleus verschaefeltii* (275-16), on *Ionoxalis intermedia* (4-17), on *Terminalia catappa* (93-22); on *Pavonia typhalaca* at Canóvanas (246-13); on *Gossypium barbadense* at Ponce (I No. 1377), at Guánica (480-13); on *Melia azedarach* at Fortuna (396-13); on *Solanum nigrum* var. *americanum* (473-12), on *Sida* sp. (474-12), and on *Melia azedarach* (788-12) at Luquillo; on *Thespesia grandiflora* at Manatí-Ciales (55-15).

Saissetia oleae Bernard

(as *Lecanium*) Busck 00-92: on *Calabassa* tree at Lares, on honey-locust at Adjuntas, on *Guazuma ulmifolia* at Guayama, on *Terminalia catappa* at Mayagüez.

Van Z. (13): on *Erythrina micropteryx*, oleander, orange, *Guazuma ulmifolia*, *Terminalia catappa* and *Solanum torvum* at Mayagüez.

Wolcott 24-32: eaten by *Anolis cristatellus*.

Dozier 26-118 & 27-272; held in check by *Lecanobius cockerelli* Ashmead and *Eupelmus saissetiae* Silvestri.

Pastor Rodríguez 33-30: on cotton.

Leonard 33-118, 129: on mahogany, on *Vitex altissima*.

on grapefruit at Pueblo Viejo (I No. 423, 426), at Bayamón (I No. 50, 67, 136), at Naguabo (I No. 1580), at Garrochales (I No. 1032), at Vega Alta (I No. 29), at Vega Baja (I No. 16, 138), at Manatí (60-33); on orange at Palo Seco (30-34), at Mayagüez (I No. 279); on pomarrosa at Corozal (I No. 1861 Leonard 33-122); on *Ficus* sp. at Fajardo (145-32); on African tulip tree, *Spathodea campanulata* (I No. 1164); on *Erythrina glauca* (230-13); on almendra at Guánica (228-12, I No. 2334); on *Sicania odorifera* 207-17); on tamarind at Ponce (I No. 2558); on poinsettia at Palo Seco (30-34); on *Spondias dulcis* at Ponce (I No. 2958); on okra at Trujillo Alto (I No. 1418, 1459 Leonard 32-134); on quiscualis vine at Santurce (77-33); on gandul at Lajas (I No. 1902 Leonard 33-122); on soursop at Maricao (I No. 337).

Aclerda sacchari Teague, M. M., "A Review of the Genus *Aclerda* (Hemiptera: Coccidoidea)." Ann. Ent. Soc. Amer., Vol. 18, No. 4, pp. 433-441, pl. 3. Columbus, Ohio, December 1925: TYPE, on sugar-cane stalks and roots, from P. R., probably from Guánica.

(all P. R. records are under the name *A. tokionis* Cockerell).

Smyth 19-150: on sugar-cane.

Wolcott 2-24: 0.1% of sugar-cane infected in transmission of mosaic disease experiments by E. G. Smyth.

IP-286: on sugar-cane (1-15 det. E. R. Sasser as *A. tokionis* Cockerell, 103-18), at Humacao (144A-16), at Guánica (585-14, 645-14).

Earle 28-173: mention. EEWI-240: notes.
on sugar-cane at Guánica (48-24 TYPE).

DIASPINÆ

Chionaspis citri Comstock

Busck 00-93: on lime at Añasco.

Barrett 03-445: on mango and lime.

Tower 09-24, 25: on orange.

Van Z. (7): on orange at Manatí and Garrochales; *Pilea* sp., *Citrus decumana*, and grapefruit at Garrochales.

Jones 17-9: "this species is one of the most injurious scale pests of the citrus groves of Porto Rico."

Stevenson 18-134, 185, 219: host of *Myriangium duriaei* at Sabana Llana, Río Piedras, Pueblo Viejo, Bayamón, Santurce, Espinosa, Vega Baja and Garrochales; host of *Septobasidium spongia* at Río Piedras, Espinosa, Pueblo Viejo, Campo Alegre, Garrochales, Vega Baja and Bayamón; host of *Tubercularia coccicola* at Espinosa, Río Piedras, Pueblo Viejo and Bayamón.

EEP-69: on citrus.

Dozier 25-14 and 26-118: abundant on citrus.

Faxon & Trotter 32-446: on citrus.

forty-six interception records on grapefruit, at Río Piedras, Pueblo Viejo, Bayamón, Palo Seco, Dorado, Toa Alta, Vega Alta, Vega Baja, Manatí, Barceloneta, Garrochales, Arecibo, Mayagüez and Trujillo Alto; on orange (101-19, I No. 123), at Bayamón (I No. 192, at Ponce (I No. 296), at Mameyes (839-12); on sour orange at Yabucoa (141A-16), at Loíza (254-16).

Chionaspis sp. near **spartinae**—det. H. Morrison

on *Sporobolus bertoreanus* at Arecibo playa (163-23).

Howardia biclavis Comstock

Busck 00-93: on *Bixa orellana* at San Sebastián and Añasco.

Hooker: on coffee (625), on *Achras sapota* (1251), *Mammea americana* (1252), on *Doryalis caffra* (1649) at Mayagüez.

Van Z. (1230): on *Bixa orellana*, *Achras sapota*, and *Plumiera rubra*.

Stevenson 18-134: host of *Myriangium duriaei* at Río Piedras.

Dozier 27-273: on *Acalypha*, host of *Pseudoteroptrix imitatrix* Fullaway.

on *Bixa orellana* (263-12), on *Hymenaea courbaril* (37-14), on *Casearia arborea* (232-13), on *Cajanus indicus* (982-13), on *Guettarda scabra* (233-13); on *Chrysophyllum cainito* (829-12), and on *Mammea americana* (835-12) at Mameyes; on níspero (I No. 1136); on passion vine (I No. 1165 Leonard 32-135); on *Gliricidia sepium* at Mayagüez (106-31 det. H.

Morrison—Leonard 32-128); on casuarina at Arecibo (I No. 2585); on *Guettarda scabra* (738-13), and *Cordia* sp. (737-13) at Dorado; on *Tecoma pentaphylla* (59-14), and *Acalypa wilkesiana* (56-15) at Naguabo; on *Cassia fistula* at Aguirre (75-16); on *Castilla elastica* at Bayamón (415-16); on *Waltheria americana* at Martín Peña (277-16).

Diaspis boisduvalii Signoret—det. H. Morrison

on malay apple at Trujillo Alto (I No. 1738 Leonard 33-118); abundant and troublesome on orchid, *Cattleya percivaliana*, at Monte Flores, Santurce (50-35 det. H. Morrison).

Diaspis bromeliae Bouche—det. H. Morrison

on pineapple (I No. 353), at Bayamón (I No. 1131), at Corozal (I No. 18), at Manatí (I No. 395).

Diaspis echinocacti Bouché

(as *Diaspis calytroides* Costa, var. *opuntiae* Ckll.) Busek 00-93: at Ponce.

Fernald 03-229: listed from P. R.

AMC: at Coamo Springs ix-30.

on cactus (I No. 1397 Leonard 32-124); at Coamo (I No. 1206 Leonard 32-124), at Ponce (I No. 2560).

Aulacaspis pentagona Targioni. The White Scale of Papaya.

Busek 00-93: on castor-oil plant at Río Piedras, on unknown tree at Bayamón, on peach at Adjuntas, on honey-locust, on "mahagua" at Fajardo.

Earle 03-458, 467: "very commonly on orange, as well as on various other trees and plants----killing a great many of the (pawpaw) trees."

Barrett 03-446: very destructive to peach trees in the east part of the Island; also attacks mulberry and pawpaw.

Tower 07-27: very abundant all over the Island, infesting peach, plum, mulberry, pawpaw, castor bean and other plants.

Jones 15-4: on okra and pepper.

Johnston 15-28: host of *Myriangium duriaci* at Puerblo Viejo, Santurce, and Río Piedras.

Jones 17-9: the papaya suffers especially from its attacks.

Cotton 18-303: on okra.

Stevenson 18-134: host of *Myriangium duriaci* at Río Piedras and Sabana Llana.

Hooker (1651): on *Salix humboldtiana* at Mayagüez.

Van Z. (1248): on *Carica papaya*, *Hyptis* sp., *Erythrina micropteryx*, *Nerium oleander*, *Capscum* sp., orange; on *Mangifera indica* at Mayagüez; on *Paritium tiliaceum* at Mameyes and Adjuntas; on *Manihot utilissima* at Añasco.

EEP-69: a pest on papaya.

Dozier 27-277: host for *Aspidiotiphagus lounsburyi* Berlesi & Paoli.

Faxon & Trotter 32-446: coating papaya fruit and trees.

Leonard 32-135 & 33-121: on papaya.

on "malva" (290-12), on *Cajanus indicus* (409-13), on *Hibiscus esculentus* (923A-13), on garden pepper (923A-13), at Vega Baja (I No. 984), at Barranquitas (I No. 1461); on *Trema micrantha* (982-14), on cotton (12-16), on *Acalypha wilkesiana* (471-16), on *Solanum torvum* 439-17), on *Hibiscus sabdarifa* (354-21); on *Salix* sp. at Ponce (165-12); on *Urena lobata* at Dorado (739-13), and at Bayamón (140-15); on *Bryophyllum pinnatum* at Comerío (774-13); on *Mamea americana* at Naguabo (54-14); on *Hyptis* sp. at Maricao (791-14); on *Trema micrantha* at Juana Díaz (83-15); on *Maga grandiflora* at Espinosa (84-15); on *Ricinus communis* (776-19), at Hormigueros and Guánica (85-15), at Ciales (788-13); on *Carica papaya* (684-12, 11-16), at Guánica (255-15, 261-15), at Bayamón (I No. 59), at Isabela (I No. 1991, 1992), at Adjuntas (I No. 2203), at Mayagüez (I No. 123, 1147).

Hemichionaspis aspidistrae Signoret

on leaves of fern, *Nephrolepis exaltata* var. *bostoniensis* (104-16 det. E. R. Sasser).

Pinnaspis (Hemichionaspis) buxi Bouché

on *Areca lutescens* (20-14), on *Acrocomia media* (22-14), on *Areca* sp. (116-15); on leaves of a tree epiphyte belonging to the family *Bromeliaceae* at Mameyes (832-12); on *Philodendron* sp. at Ciales (787-13); on ornamental palm at Trujillo Alto (128-22 det. H. Morrison); on cotton at Mauabo (5-22 det. G. F. Ferris); on ornamental palm (I No. 1891 Leonard 33-119).

Hemichionaspis minor Maskell

Busck 00-93: on eggplant at Cataño; on *Guazuma ulmifolia* at Guayama.

Jones 15-4: on eggplant.

Jones 17-10: "a common species sometimes found in company with *Saissetia nigra* (Nietn.), and *S. hemisphaerica* (Targ.) --- on *Pithecolobium saman* at Mayagüez.

Cotton 18-301: attacks stems and branches of eggplant.

Stevenson 18-134: host of *Myrangium duriaei* at Palo Seco.

Van Z. (1402): on eggplant, *Guazuma ulmifolia*, cotton and *Asparagus sprengeri*.

EEP-105: a pest on eggplant.

on eggplant (925A-13), on *Valerianodes jamaicensis* (334-12, 72-15); on *Gomphrena globosa* (121-15), on *Capsicum* sp. (122-16), on undetermined plant (550-12), on mulberry (527-23); on *Gossypium barbadense* at Guánica (210-13), (480-13); on *Aeschynomene sensitiva* at Naguabo (55-14); on *Melia azedarach* at Fortuna (near Ponce) (396-13); on ornamental croton (*Codiaeum* sp.) at Naguabo (92-11); on *Solanum torvum* (475-12), on *Triumfetta semitriloba* (477-12),

on *Annona reticulata* (35-15) and *Melia azedarach* (788-12) at Luquillo; on *Lantana involucrata* at Mameyes (827-12); on *Asparagus sprengeri* at Mayagüez (754-14); on *Sesbania grandiflora* at Garrochales (197-16); on *Cajanus indicus* at Old Loíza (256-16); on unknown liana at Plantaje (46-16); on *Annona muricata* at Ponce (I No. 4600); on maga at Isabela (I No. 588).

Leucaspis indica Marlatt, C. L., in Bur. Ent. (Tech. Ser.) Bul. 16 pt. II, pp. 26-27, pl. VII, fig. 2: "On mangoes imported from India, at Miami, Fla. and from Mayagüez, Porto Rico," TYPE from Porto Rico.

Jones 17-11: collected on mango (*Mangifera indica*) at Mayagüez.

Aspidiotus arctistaphylli Ckll. & Rob.—det. H. L. Dozier
under leaf-sheaths of white gramma grass, *Stenotaphrum secundatum* (111-24).

Aspidiotus camelliae Signoret—det. H. Morrison.
on grapefruit at Trujillo Alto (I No. 715).

Aspidiotus (Aonidiella) cocotiphagus Marlatt—det. H. Morrison.
on coconut palm fronds from Pt. Cangrejos (GNW); on *Jasminum sambac* at Monte Flores (301-23); a serious pest of orchids at Monte Flores (50-35); on maria, *Calophyllum antillanum*, (I No. 2333 Leonard 33-119); on banana at Arecibo (I No. 5754).

Aspidiotus cyanophylli Signoret

Van Z. (1606): on *Aleurites cordata*, banana, *Clusia rosea*, *Eugenia malaccensis*, *Dillenia indica*, *Vitex divaricata*, *Nerium oleander*, *Eriobotrya japonica*, *Pischofia* sp., *Washingtonia robusta*, *Eucalyptus* sp., *Barringtonia* sp., *Viola* sp., *Monstera deliciosa*, *Albizia stipulata*, *Piper* sp., *Mangifera indica*, and *Citrus decumana*.

on *Eucalyptus* at Naguabo (52-14).

Aspidiotus destructor Signoret

Cockerell, T. D. A., 95-261: Can. Ent., XXVII.

Busck 00-93: on banana leaves at Cataño, San Juan and Arroyo. Barrett 03-447: at Ponce many of the coconut trees were dead or dying from attacks of this coccid.

Van Z. (1229): on *Cocos nucifera*, *Phoenix dactylifera* and *Musa* sp.

Stevenson 18-207: host of *Botrytis rileyi* at Punta Cangrejos.

EEP-69: on coconut fronds.

Dozier 27-277: host of *Aspidiotiphagus lounsburyi* Berlesi & Paoli.

González Ríos 21-19: a pest of coconut.

Leonard 32-127: on coconut.

EEWI-358 to 360: an economic account.

on *Grevillea robusta* (288-12), on *Psidium guajava* (286-12, 2-17), on *Musa paradisiaca* var. (686-12), at Bayamón (I No. 2233); on screw palm, *Pandanus* sp., (117-15), on *Euphorbiaceous* plant (86-16), on *Terminalia catappa* (93-22 det. G. F. Ferris, I No. 1464), at Arecibo I No. 1501), at Mayagüez (I No. 5065); on *Persea gratissima* (18-16), at Mameyes and Guayama (82-13); on *Annona palustris* at Algarrobo (793-14); on *Mammea americana* (25-16), and *Cocos nucifera* (352-17, 134-16, 31-11), at Plantaje (26-16), on pomegranate at Aguirre and Guánica (193-16); on undetermined plant at Barceloneta (221-16); on flame at Isabela (I No. 5821), on carambola tree (35-35 det. H. Morrison).

Aspidiotus forbesi Johnson

Fernald 03-259, 269: occurs in Porto Rico.

Jones 17-12: "with the possible exception of 'Jazmines' no tropical plants are included in the list."

Aspidiotus hederæ Vallot—det. H. Morrison.

on grapefruit at Trujillo Alto (I No. 715).

Aspidiotus lataniae Signoret

Hooker (1635); on *Castilla* sp. at Mayagüez.

on *Jasminum sambac* at Monte Flores (301-23 det. H. Morrison); on mamey zapote at Naguabo (I No. 1594).

Aspidiotus sacchari Cockerell

Van Dine 11-19, 31; 12-22; 13-34; 13-251, 257: on sugar cane.

Hood, J. D., in *Insecutor Insectiæ Menstruus*, Vol. I, No. 6 pp.

65-70, June, 1913: taken with *Odonaspis* sp. on stalks of "malojillo" (*Panicum barbinode*) at Guánica.

Jones 17-12: on sugar cane at Canóvanas.

Smyth 19-150: on sugar cane. Wolcott 21-35: on sugar cane.

Earle 28-173: mention.

Leonard 32-139 and 33-126: on Vieques Id.

on sugar cane (98-12 det. Van Dine); on sugar cane at Guánica (14-10), at Fortuna (53-10), at Fajardo (21-11), (81-11), at Humacao (99-12).

Pseudaonidia articulatus Morgan

Busck 00-13: from orange leaves on El Yunque, about 2,000 ft. altitude.

Barret 03-445: on citrus. Tower 08-38 & 09-25: on orange.

Van Z. (15): on orange.

Jones 17-12: on *Anona muricata* at Río Piedras.

Stevenson 18-219: host of *Microcera fujikuroi* at Pueblo Viejo.

EEP-69: a pest on citrus.

(as *Selanaspidus*) Dozier 25-14: on fruit. Dozier 26-118: abundant on citrus.

Faxon & Trotter 32-446: on citrus. EEWI-398: mention.

sixty interception records on grapefruit, at Trujillo Alto, Río Piedras, Pueblo Viejo, Bayamón, Palo Seco, Toa Alta, Vega Alta, Vega Baja, Manatí, Barceloneta and Garrochales; seventeen interception records on orange, at Pueblo Viejo, Bayamón, Aguadilla, Mayagüez, Ponce and Fajardo; on wild orange (16-16), at Carolina (48-15); on pomarrosa (437-12), at Corozal (I No. 1861); on *Ficus nitida* (58-15), at Caguas (I No. 2165); on tamarind at Ponce (I No. 292), at Mayagüez (I No. 306), at Cabo Rojo (I No. 308), at Río Piedras (I No. 333); on corazón at Ponce (I No. 1743); on caimito at Garrochales (13-16); on Eucalyptus at Naguabo (52-14); on coffee at Mayagüez (166-32); on banana at Arecibo (I No. 5754); on drecena leaves (I No. 223); on *Antidisma buniis* at Mayagüez (I No. 1532); on *Brunfelsia* (I No. 3182).

Pseudaonidia tessera de Charmoy

on garden rose (441-17 det. R. T. Cotton); at Mameyes (838-12 det. E. R. Sasser) on rose; on *Inga laurina* at Lares (6-22 det. G. F. Ferris).

Chrysomphalus aonidium Linnaeus

Busck 00-93: on *Terminalia catappa* at San Juan; on *Anona muricata* at San Juan; on oleander at Ponce; on *Musa* at Caguas.

(as *Aspidiotus ficus*) Earle 03-459; Barret 03-445:

(as *Chrysomphalus ficus*) Tower 07-25, 26; 08-32; 09-24; on orange.

Tower 11-14, 15: on orange and lemon.

Carnes, E. K., in Bull. State Comm. Hort., Vol. I, No. 8, 1912, Sacramento, California, on p. 398: received from Porto Rico.

Johnston 15-29: host of *Sphaerostilbe coccophila* at Bayamón.

Stevenson 18-219: host of *Microcera fujikuroi* at Pueblo Viejo.

Van Z. (8): on orange, lemon, "pomelo", rose, *Agave sisalana*, *Cocos nucifera*, oleander, *Anona muricata*, *Musa* sp. and *Terminalia catappa*.

EEI'-69: on citrus.

Dozier 25-14: not abundant.

Faxon and Trotter 32-446: on citrus.

(as *C. ficus*) Leonard 31-116 and 32-1251: mention.

EEWI-398: on citrus.

on *Ficus nitida* at San Juan (58-15), at Caguas (I No. 2165); on grapefruit at Bayamón (I No. 801), at Pueblo Viejo (I No. 2505-B), at Carolina (115-15); on *Gemmingia chinensis* at Bayamón (147-15); on leaves of *Cocos nucifera* at Guánica (171-16); on wild orange at Ponce (52-22), at Corozal (I No. 186).

(Chrysomphalus aurantii Maskell

Busck 00-93: on *Anona muricata* at San Juan; on *Anona muricata* at Ponce.

Barrett 03-445: reported it as an enemy of citrus stock, with note, "rare but apparently spreading".

Van Z. (14): on orange and rose.

Smyth 19a-125: on *Muraya exotica*.)

Not present in Puerto Rico, according to H. Compere.

Chrysomphalus dictyospermi Morgan

Leonard 33-118: on mahogany (det. H. Morrison).

on *Mangifera indica* (530-12), on *Cocos nucifera* (864-14);
on *Cycas revoluta* at Naguabo (53-14, 333-17); on *Kentia palm*
at Trujillo Alto (I No. 439); on guava (I No. 1535).

Chrysomphalus personatus Comstock

(as *Aspidiotus*) Busck 00-93: on plantain leaves at Caguas;
on *Anona muricata* at San Juan; on banana leaves at Cataño;
on coconut palm at Mayagüez.

Van Z. (1228): on coconut palm, mango, *Bertholletia excelsa*,
Inga laurina, *Musa* sp. and *Anona muricata*.

Jones 17-13: on *Mangifera indica* at Santa Isabel; on *Ficus*
sp. at Mameyes.

EEWI-483: on banana.

on *Ficus* sp. (19-22, 549-12); on *Eugenia jambos* (237-
13), on *Laguncularia racemosa* (13-14), on *Banisteria lauri-*
folia (859-14), on *Calophyllum calaba* (148-15), on *Annona* sp.
(598-16); on *Ficus nitida* at San Juan (58-15); on *Euca-*
lyptus sp. at Naguabo (52-14); on *Jasminum sambac* at Fa-
jardo (143A-16); on undetermined plant at Canóvanas (192-
16); on *Mammea americana* at Plantaje (25-16), at Mameyes
(836-12), at Cuyey Alto (417-16); on *Symplocos latifolia* at
Bayamón (418-16); on *Cocos nucifera* (213-11), at Pt. Can-
grejos (119-21 det. H. Morrison).

Pseudischnaspis bowreyi Cockerell

Hooker (1652): on asparagus at Mayagüez.

Van Z. (1256): on rose and *Persea gratissima*.

EEWI-309: on agave.

on *Agave sisalana* (520-17 det. H. F. Dietz).

Targionia biformis Cockerell

Hooker (1236): on *Bromelia pinguin* at Mayagüez.

Van Z. (1647): on *Agave sisalana* at Mayagüez.

Jones 17-13: on *Agave sisalana*, *Persea gratissima* and *Mangi-*
fera indica at Río Piedras; on *Cycas revoluta* at Naguabo.

EEWI-309: on maguey.

on *Bromelia pinguin* at Mameyes (824-12), at Naguabo
(142A-16), at Canóvanas (195-16); on *Agave sisalana* on
Trujillo Alto road (93-16), at Salinas (77-16), at Cabo Rojo
(3-16) and at Cayey (GNW); on *Pedilanthus tithymaloides*
at Fortuna (164-16); at Guánica (130-23); on tuberose, or
"azucena" (67-33).

Pseudoparlatoria ostreata Cockerell. The Grey Scale of Papaya.
Van Z.: on *Solanum scaphothianum* and *Acalypha* sp. at Mayagüez.

Leonard 32-124, 125: on garden plants, on papaya.

EEWI-496: the grey scale of papaya.

on *Piper medium* at Manatí (104-31 det. G. F. Ferris); on passion vine (I No. 1165 Leonard 32-135); on panama potato tree at Juncos (I No. 1775 Leonard 33-120); on red ornamental, *Achyranthes* sp. (33-35 det. H. Morrison) and on "dama de noche", *Cestrum nocturnum*; killing the latter down to the ground (51-35); on papaya at Isabela (104-31 det. H. Morrison), at Aguadilla (I No. 1154), at Mayagüez (I No. 1148).

Lepidosaphes beckii Newmian

(as *Mytilaspis citricola*) Earle 03-457, 458; Barrett 03-445:

Tower 07-26; 08-32, 33; 09-23, 24; 10-24, 25: on orange and citrus. Tower 11-13, 15: on citrus.

Carnes 12-398: from Porto Rico.

Van Z. (6): on orange and lemon.

Johnston 15-13: host of *Aschersonia turbinata* at Río Piedras.

Johnston 15-29: host of *Scoleconectria coccicola* at Pueblo Viejo, and Río Piedras.

Johnston 15-29: host of *Sphaerostilbe coccophila* at Río Piedras.

Jones 17-14: "this species has been more often mentioned as a pest of citrus orchards than any other scale insect-----the species was taken on ornamental croton (*Codiaeum* sp.) at Río Piedras by the writer."

Cotton, R. T., "Scale-Feeding Habits of a Porto Rican Millepede, *Rhinocritus arboreus* Saussure". Jour. Dept. Agr. P. R., Vol. 1, No. 3, July, 1917, pp. 175-176: "-----about a dozen (of these millepedes) placed on several small grapefruit trees that were heavily infested with purple scale.-----At the end of two weeks the trees were perfectly clean and free from scales and the bark took on a fresh green color." (Quoted in EEWI-344.)

Stevenson 18-185: host of *Septobasidium spongia* at Río Piedras, Espinosa, Pueblo Viejo, Campo Alegre, Garrochales, Vega Baja and Bayamón.

Stevenson 18-134: host of *Myrangium duriaei* at Sabana Llana, Río Piedras, Pueblo Viejo, Bayamón, Santurce, Espinosa, Vega Baja, Garrochales.

Stevenson 18-150: host of *Scoleconectria coccicola* at Río Piedras, Pueblo Viejo, Bayamón, Espinosa, Garrochales and Mayagüez.

Stevenson 18-150: host of *Sphaerostilbe coccophila* at Río Piedras, Pueblo Viejo, Bayamón, Vega Baja, Manatí, Espinosa, Garrochales and Mayagüez.

Stevenson 18-219: host of *Microcera fujikuroi* at Bayamón, Mayagüez and Pueblo Viejo.

Stevenson 18-219: host of *Tubercularia coccicola* at Espinosa, Río Piedras, Pueblo Viejo, Bayamón.

Smyth 19a-126: on *Muraya exotica*.

Earle, F. S., "The Cultivation of Citrus Fruits in Porto Rico". Circ. No. 28, Insular Expt. Sta., Río Piedras, pp. 20. San Juan, September 1920: on p. 16 a general discussion.

Catoni, L. A., "Plagas de Insectos que Atacan a los Árboles del Género Citro en Puerto Rico y cómo Combatirlos". Rev. Agr. P. R., Vol. 5, No. 4, pp. 35-39. San Juan, 1920.

EEP-69: a pest of citrus.

Dozier 25-13: "The most serious of the scales attacking citrus."

Strong, L. A., "Quarantine Division. Synopsis of Work". Monthly Bull. Calif. Dept. Agr., Vol. 10, No. 9, pp. 381-385, Vol. 10, Nos. 5 & 6, p. 212, & Vol. 9, Nos. 5 & 6, pp. 471-476. Sacramento, 1921 & 1922: intercepted on orange and grapefruit from P. R.

Dozier 26-118: the worst scale on citrus.

Faxon & Trotter 32-446: on citrus.

Leonard 31-116 & 32-125: mention.

EEWI-391 to 396: an economic account.

thirty-six interceptions on grapefruit at Bayamón, sixty on grapefruit at Pueblo Viejo, Toa Alta, Vega Alta, Vega Baja, Manatí, Barceloneta, Garrochales, Naguabo and Guayama, at Isabela (34-35); eight on orange at Trujillo Alto, Bayamón, Naguabo and Lares; thirty-three on wild orange at Garrochales, Aguadilla, Mayagüez, Juana Díaz, Adjuntas, Ponce and at Loiza (254-16); on citron (I No. 95), at Ponce (I No. 341); on lemon (I No. 96, 101); on *Muraya (Chalcas) exotica* (19-18).

Lepidosaphes crotonis Cockerel—det. H. Morrison
on *Inga vera* at Utuado (31-35).

Lepidosaphes gloverii Packard—det. H. Morrison
on grapefruit at Pueblo Viejo (I No. 426); on guava (I No. 1535).

Lepidosaphes lasianthi Green
on *Croton humilis* (548-12 det. E. R. Sasseer), at Santurce (I No. 1555), at Bayamón (122-32 det. H. Morrison).

Parlatoria pergandii Comstock—det. H. Morrison
Faxon & Trotter 32-446: on citrus.
on grapefruit (I No. 126), at Bayamón (I No. 66), at Palo Seco (I No. 113), at Vega Alta (I No. 29, 91), at Manatí (I No. 119); on tangerine at Bayamón (I No. 177).

Ischnaspis longirostris Signoret
Busck 00-93: on coconut palm at Caguas, Cataño, Mayagüez, and Arroyo.
Hooker (1654): on *Ficus repens* at Mayagüez.

Van Z. (1604): on *Roystonea borinquena*, *Washingtonia robusta*, coffee, *Pterocarpus draco*, *Bignonia unguis-cati*, at Mayagüez. on *Ixora ferrea* (756-14), on *Acrocomia media* (757-14), on *Dalbergia monetaria* (79-15), on *Annona* sp. (598-16); on *Citharexylum fruticosum* at Naguabo (911-14); on *Asparagus sprengeri* at Mayagüez (754-14); on *Jasminum sambac* at Santurce (69-21), on *Cocos nucifera* (on outside husk of fruit) at Mayagüez (144-21, 436-21); on ornamental palm at Trujillo Alto (128-22 det. H. Morrison); on *Kentia* palm at Trujillo Alto (I No. 439); on *Ficus nitida* at Caguas (I No. 2165 Leonard 33-130); on *Canna* at Mayagüez (I No. 5725).

ALEYRODIDÆ

Quaintance, A. L.
& Baker, A. C.,

"Classification of the Aleyrodidæ, Parts 1 & 2." Bull. No. 27, Bur. Ent. (Technical Series), U. S. Dept. Agr., Washington, D. C., March 6, 1913.

Cotton, R. T.,

"*Aleyrodes citri* not in Porto Rico." Jour. Ec. Ent., Vol. 10, No. 3, p. 377. Concord, N. H., June 1917.

Aleurodicus griseus sp. nov. Dozier

Pupa case.—Length 1.02 mm.; greatest width 0.645 mm. Rather flat and when removed leaves a distinct outline band of wax attached to the leaf surface. A very distinctive grayish waxy bloom covers the pupa case entirely except for the dorsal pores and a median line on the posterior half of the dorsum. From the dorsal pores arise very fine grayish-white filaments of wax and the pupa itself lies closely appressed to the leaf surface in the midst of a nest of curly waxen filaments. Elongate in general outline, the dorsum slightly convex, with the abdominal segments distinct. Deep yellow in color with a distinctly darker orange area on each side of the abdomen. Margin of case lightly dentate. the submarginal area set off with a series of widely separated, inconspicuous setæ, following around the border, approximately twelve on each side. Dorsum without simple pores but there are seven pairs of large compound pores, one pair at the cephalic portion of the case, and six pairs extending on the dorsum at the end of the abdominal segments and around the orifice. The vasiform orifice subcordate, the cephalic margin nearly straight; operculum transverse, occupying slightly over a third of the orifice and obscuring the basal portion of the lingula; lingula stout, rather long but not quite reaching to the caudal margin of the orifice, with two pairs of long setæ near the tip; together, the operculum and lingula almost fill the entire orifice.

Described from numerous pupæ, adults, and all stages taken on foliage of the shrub, "Hoja minuda", *Eugenia buxifolia*, along roadside near Punta Cangrejos, P. R., July 19, 1925, H. L. Dozier.

This species has the unusual habit of settling always on the upper surface of the leaves instead of on the underside, arranging themselves along the midrib. The adults are a distinct slate gray in color and covered with a mealy bloom. They are very sluggish, lying very closely appressed to the leaf surface near the pupa case from which they issued. The newly settled crawler is very elongate in shape and has a distinct marginal fringe of short but rather thick white waxy bands, and arising from the dorsum are two thick columns of white wax. The second stage is a yellowish green in color, lacking the wax secretion of the first instar, and so closely appressed to the leaf surface that it is very inconspicuous. Name, description and notes by H. L. Dozier.

on *Eugenia buxifolia* at Pt. Cangrejos (975-13, 163-15, 49-15 det. H. L. Dozier from photograph); on *Eugenia ludi-bunda* at Pt. Cangrejos (50-15 det. H. L. Dozier from photograph); on *Myrcia* sp. at Pt. Cangrejos (7-15).

Aleurodicus cocois (Curtis)—det. H. L. Dozier

abundant in all stages on *Washington robusta* palm at the Experiment Station, Río Piedras, during November and December 1924; adult and pupæ abundant on underside of coconut palm foliage at Río Piedras, Dec. 11, 1924 (Dozier); on coconut palm at Guayama (3-30 det. H. L. Dozier).

Aleurodicus antillensis sp. nov. Dozier

This species resembles *Aleurodicus ornatus* Ckll. most closely in the adult stage, having conspicuously maculated fore wings, but differs distinctly in that the pupa case has a different margin and a very characteristic and distinctive fuscous area on its dorsum at the juncture where the case splits when the adults issue. Also resembles somewhat *A. dugesii* but differs in many details.

Pupa case.—Length 0.989 mm.; greatest width 0.659 mm. Elongate oval in outline, the margin simple and not dentate, a pair of small, inconspicuous setæ at caudal end. Dorsum with five pairs of large compound pores, one pair at the cephalic portion, and four pairs extending along the dorsum at the end of the abdominal segments; a very small, inconspicuous, simple pore is visible under high power at each side of the vasiform orifice. Vasiform orifice only slightly subcordate, wider than long, the cephalic margin nearly straight; operculum transverse, occupying slightly more than one half of the orifice and obscuring the basal portion of the lingula; lingula long, spatulate, with two pairs of long setæ near the tip, extending a third its length beyond the vasiform orifice.

Described from numerous pupa cases collected on coconut palm and on several "Santa Maria" trees, *Calophyllum antillanum* Britton in park at Santurce, Dec. 21, 1924 (1-25 TYPE);

three pupa cases on leaf of *Erythrina glauca* at Río Piedras, Dec. 22, 1924 (Dozier). Name, description and notes by H. L. Dozier.

Aleurodicus (Metaleurodicus) variabilis Quaintance—det. H. L. Dozier

Dozier 26-122: on papaya, host of *Encarsia* sp.

abundant on foliage of *Carica papaya* at Santurce, (3-25).

Aleurodicus (Metaleurodicus) minimus Quaintance, A. L., "Contributions toward a Monograph of the American Aleurodidae". Bull. 8, Bur. Ent. (Technical Series) U. S. Dept. Agr., pp. 43-47, pl. vi, figs. 63-67. Washington, D. C., 1900: TYPE from Porto Rico: "on *Guayava* sp." "a large number killed by a fungus".

Quaintance and Baker 13-77: generic transfer to *Metaleurodicus*.

Cotton 17-377: on guava.

Johnston 15-11; Stevenson 18-218: host of *Aegerita webberi* Faw.

Johnston 15-12 to 14; Stevenson 18-203: host of *Aschersonia aleyrodi* Webber and *A. flavo-citrina* P. Henn.

Dozier 26-121: on guava and *Cestrum diurnum*; host of *Encarsia* sp.

on *Psidium guajava* (115-12, 211-12, 379-13, 754-13 det. A. L. Quaintance, 1 No. 1515 det. G. B. Merrill, 1 No. 1926 Leonard 33-117), at Arecibo (230-19), at Manatí (1 No. 663), at Mayagüez (1 No. 1156).

Leonardius lahillei Leonardi

Quaintance & Baker 13-39 to 41, pl. ix: on *Phoradendron*, parasitic on almond at Mayagüez; re-described and figured.

Van Z. (1617) on *Phoradendron* sp.

Paraleyrodes naranjæ Dozier, H. L., "An Undescribed White Fly Attacking Citrus in Porto Rico". Jour. Agr. Research, Vol. 34, No. 9, pp. 853-855, fig. 3. Washington, D. C., May 1, 1927. TYPE on sour orange from Santurce, P. R.

EEWI-436: on sour orange.

Dialeurodes busckii Quaintance & Baker TYPE from P. R.

Dialeurodes citrifolii Morgan

Dozier 26-121: on sour orange at Río Piedras, not in commercial citrus groves.

on lime at Ponce (1 No. 2198 det. G. B. Merrill).

Bemisia inconspicua Quaintance

Leonard 33-124: on sweet potato at Arecibo.

Bemisia sp. "probably new" det. A. L. Quaintance

on *Euphorbia hypericifolia* (23-15).

Aleurothrixus floccosus Maskell (= **A. howardi** Q. fidé Dozier)

(as *Aleyrodes howardi* Q.) Tower 11-11: on guava and orange, life-history and control.

(as *Aleurothrixus howardi* Q.) Van Z. (4) on guava and orange.

(as *Aleurothrixus howardi* Q.) Cotton 17-377: on guava.

(as *Aleurothrixus howardi* Q.) EEP-68: on citrus.

(as *Aleurothrixus howardi* Q.) Dozier 27-272: on lignun-vitæ at Aguirre; host of *Thysanus flavus* Girault.

(as *Aleurothrixus howardi* Q.) Dozier 27-854: on sour orange.

Dozier 25-14, fig. 5: "on citrus, lignum-vitæ, bananas, almá-cigo, canna, sea-grape and many other plants", controlled by **Eretmocer** *californicus*.

Dozier 26-122: host of *Eretmocer* *californicus* Howard (det. A. B. Gahan).

Dozier 32-116: host of *Eretmocer* *portoricensis* sp. nov. Dozier. The previous record of *E. californicus* based on a misidentification.

Leonard 32-125: on Meyer lemon.

FEWI-436: a minor pest on citrus in P. R.

on orange at Pueblo Viejo (302-12); on grapefruit (898-14, 775-19), abundant in Bayamón district (34-33), at Vega Alta (123-17), at Toa Baja (1 No. 2374), at Palo Seco (1 No. 111), at Manatí (1 No. 120, 2348, 4717 and 65-32); on *Citrus decumana* at Espinosa (82-15); on guava (753-13 det. A. L. Quaintance); on *Spondia dulcis* at Ponce (1 No. 2958).

Aleurotrachelus trachoides Back

(as *Aleurodes*) Van Z. (911) on *Solanum nigrum*, *S. seaforthianum*, eggplant, tomato and pepper.

Leonard 33-115, 123: on eggplant, on Irish potato.

on *Solanum torvum* (65-17); on tobacco (378-17); on pepper at Arecibo (1 No. 1381 Leonard 32-136 & 33-121).

Tetraleurodes ursorum Cockerell, T. D. A.: TYPE from P. R., on *Coccoloba* sp., Jan. 12, 1899 (A. Busck).

Aleuroplatus sp.—det. A. C. Baker

on ? in coffee grove (431-21).

HEMIPTERA

Mr. Otto Heidemann made the earlier determinations of Hemiptera on which the original records in this section are based, and Mr. E. H. Gibson those at a later period, besides describing two species of *Dicyphus* which feed on tobacco. More recently Mr. W. L. McAtee, of the Bureau of Biologic Survey, has made many determinations, and to him the compiler is also indebted for references to literature. Following the publication of his "Preliminary Report", Mr. H. G. Barber determined practically every specimen of Hemiptera collected in Puerto Rico since, and concerning such determinations has been unfailingly prompt in replying to questions of the compiler in the preparation of this revision. The appearance of Mr. Barber's definitive paper on the Hemiptera of Puerto Rico and the Virgin Islands may be expected within the next few months.

- Barber, H. G.,** "A Preliminary Report on the Hemiptera-Heteroptera of Porto Rico collected by the American Museum of Natural History." Amer. Mus. Novitates No. 75, pp. 13. New York, May 11, 1923.

CORIXIDÆ

Corixa reticulata Guerin

Gundlach.

(as sp.) Wetmore 16, 29, 40, 41, 43, 45, 61, 63, 128: eaten by Lesser Scaup Duck, Killdeer, Sandpipers, Wilson's Snipe, Ani, Woodpecker and Grasshopper Sparrow. Of the Lesser Yellow-Legs at Cabo Rojo it constituted 57.5% of the stomach contents, and of the Black-Necked Stilt over 50%.

Danforth 26-33 to 90: eaten by Gull-Billed Tern, Snowy Egret, White-Rumped Sandpiper and Ani.

AMC: at Mayagüez x-32, Cartagena Lagoon x-27, xi-30.
in jasmine flower at Bayamón (1 No. 3326-D).

BELOSTOMIDÆ

Belostoma medium Guerin

Stahl. Gundlach.

Danforth 26-52 to 74: eaten by Little Blue and W. I. Green Herons, Greater Yellow-Legs, Lesser Scaup, Allen's and Ruddy Ducks.

AMC: at Naguabo xi-28, Mayagüez iii-27, vii-32, ix-30, 1-28.

Belostoma boscai Lepeletier & Serville

Barber 23-13: listed.

Belostoma (Zaitha) anura Herrich Schaeffer

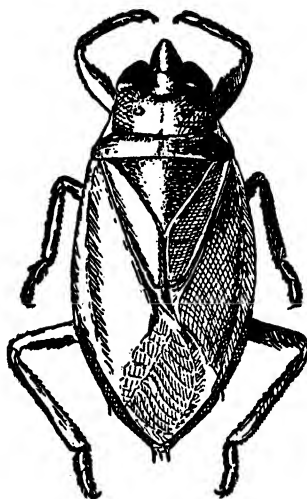
Gundlach, "en las lagunas".

Danforth 31-41: eaten by W. I. Blue Heron.

Dexter 32-6: eaten by Surinam toad, *Bufo marinus*.

AMC: at Cartagena Lagoon x-27, Yauco xii-33, Ponce xii-33, Barranquitas-32, Barros ix-30, Adjuntas xii-33, Aguadilla v-30, Luquillo vii-32, and many records from Mayagüez.

at light (87-15, I No. 900, 5902), abundant Oct. 25 (1043-16), at Condado (90-16), at Humacao (61-13), at Guánica in abundance Oct. 2 (585-13), at Mayagüez (520-12).



Belostoma fuscigera Stal. (From
Haiti.) Twice natural size.
(Drawn by F. Maximilien.)

Lethocerus annulipes Herrich-Schaeffer

Barber 23-13: listed.

NEPIDÆ

Ranatra australis Hungerford

(as sp.) Barber 23-13: listed.

AMC: at Las Marias x-30 det. H. G. Barber.

NAUCORIDÆ

Pelocoris femoratus P. B.

Barber 23-13: listed.

Danforth 26-22, 30 to 100: abundant in Cartagena Lagoon, nymphs, known as "cucarachas de agua", inflict a painful sting; adults or nymphs eaten by Least and Antillean Pied-Billed Grebes, Gull-Billed Tern (94% of the stomach contents

of one specimen), Snowy Egret, Little Blue and W. I. Green Herons, Pectoral Sandpiper, Ani and Yellow-Shouldered Blackbird.

AMC: at Cartagena Lagoon x-27, xi-30.

NOTONECTIDÆ

Buenoa macrophthalmus Fieber—det. H. G. Barber

(as sp.) Barber 23-13: listed.

in water at Ponce (I No. 5744).

Notonecta undulata Say.

Barber 23-13: listed.

(as sp.) Wetmore 16-41, 44, 61: eaten by Sandpipers and Ani.

(as sp.) Sanforth 26-52 to 100: eaten by W. I. Green Heron and Yellow-Shouldered Blackbird.

(as sp.) AMC: on El Yunque ii-27, Las Marías iii-27, Maricao iii-29, Barranquitas xii-30, Villalba vi-30, Barros x-30, Algarrobo ii-31, Ponce xii-33, Cabo Rojo xi-30, Cartagena Lagoon xi-30, x-27, and on many dates at Mayagüez.

Plea punctifer Barber 23-10: TYPE from Arecibo, P. R.

Plea puella Barber 23-11: TYPE from Arecibo, P. R., "considerably smaller than *punctifer* and about three-fourths the size of *striola*".

(as sp.) Wetmore 16-41, 100: eaten by Sandpiper and Waterthrush.

(as sp.) AMC: at Luquillo vi-32, vii-32, Río Piedras xii-31, i-32, Mayagüez x-30, Cartagena Lagoon xi-30.

(as sp.) Danforth 26-52: eaten by Little Blue Heron.

Plea striola Fieber

Wetmore 16-35, 75: eaten by Gallinule and Black Swift.

SALDIDÆ

Saldula pallipes F.

Barber 23-13: listed.

Micranthia humilis Say—det. W. L. McAtee

Barber 23-13: listed.

on weeds at Ciales (649-21).

Micranthia sp.

Barber 23-13: listed.

VELIIDÆ

Microvelia albonotata Champion—det. W. L. McAtee

(as sp.) Wetmore 16-40, 41: eaten by Killdeer and Spotted Sandpiper.

on surface of water (250-16); at light (203-11), at Guánica (EGS).

Microvelia capitata Guerin

Barber 23-13: listed.

at Isabela iii-35 (W. A. Hoffman).

Microvelia pulchella Westwood

Gundlach. Barber 23-13: listed.

Microvelia robusta Uhler—det. H. G. Barber

at Isabela iii-35 (W. A. Hoffman).

Rhagovelia angustipes Uhler

AMNH at Naguabo and Maricao.

Rhagovelia collaris Uhler

AMC: at Maricao i-29 det. W. L. McAtee, iii-29, Lares vii-31, Barros x-30, Barranquitas x-33, El Río xii-29, Luquillo vi-32, vii-32, El Yunque iv-29, Mayagüez viii-33, ix-30, vii-32.
in water at Ponce (I No. 5743 det. H. G. Barber).

Rhagovelia plumbea ? Uhler

AMC: at Boquerón iii-29 det. H. G. Barber.

Rhagovelia tayloriella Kirkaldy

Barber 23-13: listed.

GERRIDÆ

Tenagobius (Limnometra) quadrilineatus Champion—det. O. Heidemann

Van Z.

Limnogonus marginatus Guerin

(as *Gerris*) Stahl. Wetmore 16-22: eaten by Cuban Green Heron.

(as *Limnotrechus*) Gundlach.

AMNH at Coamo. AMC: at El Río xii-29, Luquillo vii-32, Utuado xii-30, Río Piedras vi-32, i-32, Mayagüez xii-32, i-30.
in water in ditch (712-16); at light at Guánica (614-13).

Gerris (Limnotrechus) cariniventris Champion

Barber 23-13: listed.

Gerris sp. nov. ?—det. H. G. Barber

in water at Ponce (I No. 5738).

Gerris guerini Lethierry & Severin

(as *Tenagobius (Limnogonus)*) Barber 23-13: listed.

AMC: at El Río xii-29 det. H. G. Barber, xii-27, Maricao xii-30, Barranquitas xii-30, Luquillo vii-32, Yauco ii-34, San Germán iii-31, xii-33, Cabo Rojo xi-30, Río Piedras xii-31, i-32, and on five dates at Mayagüez.

Rheumatobates imitator Uhler

Barber 23-13: listed.

HYDROMETRIDÆ

Hydrometra consimilis Barber 23-9: TYPE from Coamo Springs, P. R.

CRYPTOSTEMMATIDÆ (DIPSOCORIDÆ)

Ceratocombus minutus Uhler—det. H. G. Barber
on dead leaves (I No. 5907).

MIRIDÆ (CAPSIDÆ)

Chlamydatus sp. near **suavis** Reuter—det. H. G. Barber
on tender grapefruit leaves at Arecibo (I No. 2502); on
weeds at Bayamón (I No. 5720).

"apparently a new species of **Fucus** Distant"—det. W. L. McAtee
on foliage of grapefruit at Vega Alta (220-17).

Neofurios sp. ?—det. H. G. Barber
on sour orange at Consumo (I No. 5166), at Pueblo Viejo
(I No. 5232); on underside of grapefruit at Arecibo (I No.
5269).

Psallus politus Uhler—det. H. G. Barber
on grass (I No. 5586).

Reuteroscopus uvidus Distant—det. H. G. Barber
on alfalfa at Arecibo (I No. 2452); swept from weeds (I
No. 2589).

Hemispheerodella mirabilis Reuter—det. H. G. Barber
on pineapple at Lajas (I No. 4196)

Halticus nigricornis ? Reuter—det. H. G. Barber.
on tomatoes at Jayuya (I No. 2535).

Engytatus geniculatus Reuter—det. H. G. Barber
in grapefruit grove at Añasco (I No. 2295 Leonard 33-132).

Cyrtopeltis tenuis Reuter—det. H. G. Barber
on tomato at Bayamón (I No. 4403).

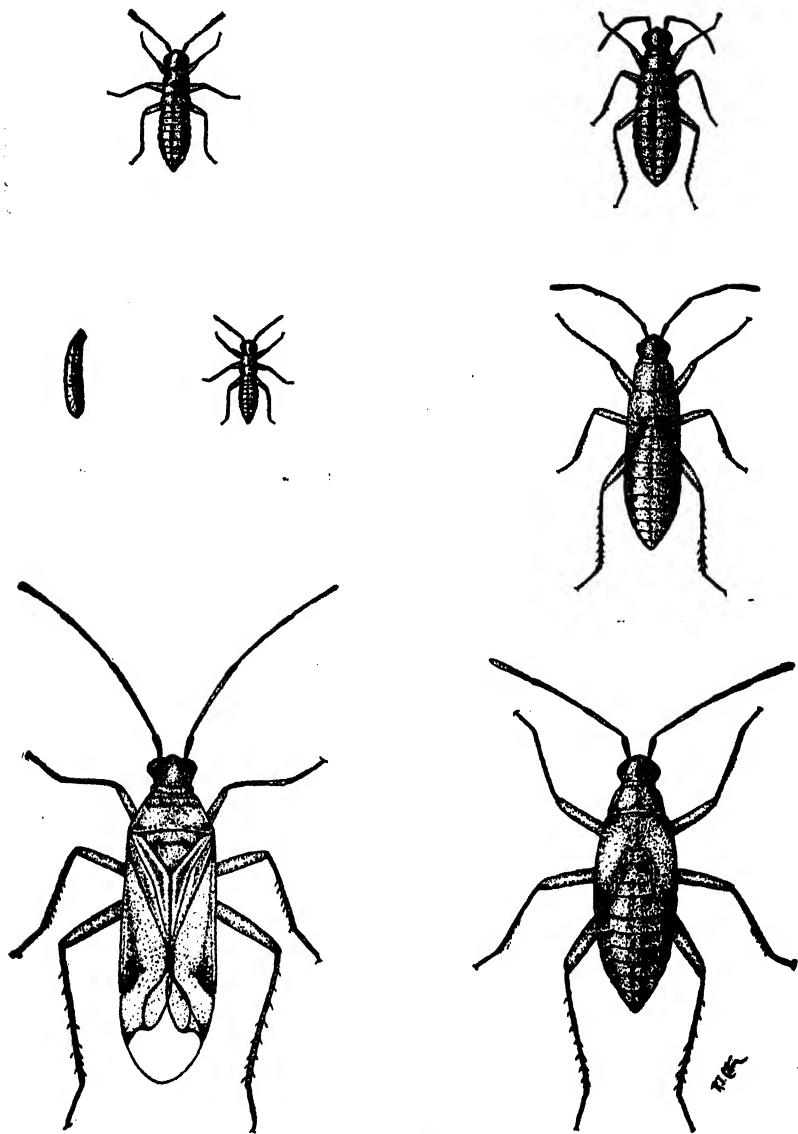
Cyrtopeltis varians Distant

(as *Dicyphus luridus*) Gibson, E. H., "Two New Species of
Dicyphus from Porto Rico." Canadian Ent., Vol. 49, No. 6,
pp. 218-219. London, Ontario, June 1917: TYPE from P. R.

(as *Dicyphus luridus* Gibson) Cotton 17-113 to 118, pl. 1: "The
Large Tobacco Suck-Fly", illustrations and descriptions of
all stages, life-history and control. EEP-11: Cotton's plate
for showing the gradual development of an insect. EEWI-
527: quoting Cotton's account

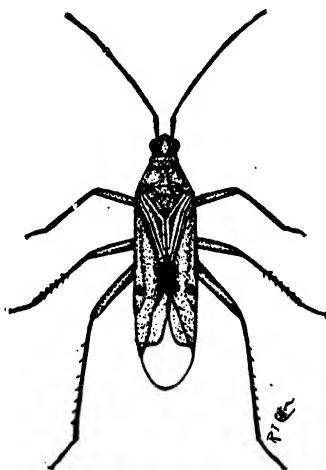
(as *Dicyphus luridus* Gibson) Leonard, M. D., "An Unrecorded
Food-Habit of the Large Tobacco Suck-Fly in Porto Rico."
Jour. Ec. Ent., Vol. 23, No. 3, pp. 640-641, Geneva, 1930:
attacking tobacco blossoms. Leonard 31-116: mention.

Bruner, S. C., "Notes on Cuban Dicyphinae (Hemiptera, Miridae)." Mem. Soc. Poey, Vol. 8, No. 1, pp. 35-49, pl. 3, ref. 6. Habana, March 10, 1934: synonymy with *Dicyphus luridus* Gibson.



Cyrtopeltis varians Distant: all stages, egg to adult. About fifteen times natural size. (Drawn by R. T. Cotton.)

on tobacco (346-17), at Ciales (782-13), at Juncos (153-16), at Aibonito (323-17 TYPE of *Dicyphus luridus*), at Cayey (127-16); on *Jathropha gossypifolia* at Martín Peña (842-14); on *Amaranthus spinosus* at Cayey (127-16); on tomato (201-16), at Loíza (I No. 1619 Leonard 33-128, 3588).



Macrolophus praeclarus Distant.

Fifteen times natural size.

(Drawn by R. T. Cotton.)

***Macrolophus praeclarus* Distant**

(as *Dicyphus prasinus*) Gibson 17-218: TYPE from P. R.

(as *Dicyphus prasinus* Gibson) Cotton 17-119, fig. 1: notes.

"Smaller and more slender—'a large, irregular fuscous spot near the costal margin of each wing-cover and midway between base and apex', not so abundant on tobacco—more frequently on tomato." EEP-103: on tomato and tobacco. Leonard 31-116: mention. EEWI-521: quoting Cotton's account.

Bruner 34-44: synonymy.

on tobacco at Aibonito (324-17 TYPE for *Dicyphus prasinus*), at Cayey (320-17), at Loíza (I No. 5138-C); on tomato (I No. 5057); egg in the midrib of tobacco leaves (345-17).

***Macrolophus separatus* Uhler—det. H. G. Barber**

on tobacco at Juana Díaz (I No. 3082).

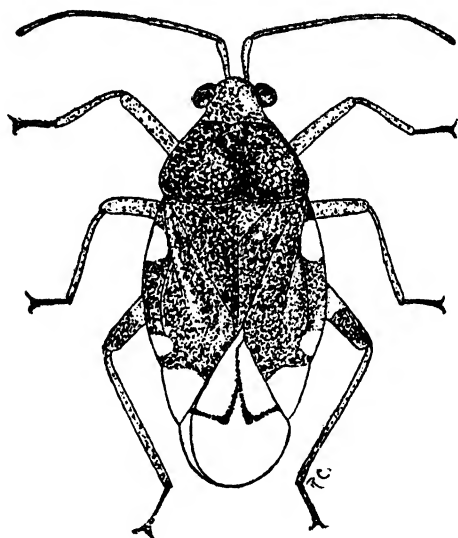
***Pycnoderes quadrimaculatus* Guerin**

Gundlach, "no es rara en el *Solanum torvum*."

(as *Pycnoderes incurvus* Distant—det. E. H. Gibson) Cotton 18-306: "The Small Black Squash Bug": life-history and control. EEP-120 & EEWI-628: quoting Cotton's account.

Wolcott 24-26: eaten by *Anolis stratulus*.

on squash and cucumber (643-17 as "*incurvus*" det. Gibson), on squash (I No. 3524), at Manatí (I No. 659); on pumpkin at Las Marías (I No. 465); on grass at Bayamón (I No. 5462).



Pycnoderes quadrimaculatus Uhler. Ten times natural size. (Drawn by R. T. Cotton.)

Pycnoderes heidemanni Reuter—det. H. S. Barber
on malojillo grass at Bayamón (I No. 3363); swept from
weeds (I No. 2587 Leonard 33-132).

Cyrtocapsus caliginus Stal—det. H. G. Barber
on squash at Aibonito (I No. 2935); on sweet potato (I
No. 2051 Leonard 33-124).

Hyaloides (Neocarnus) vitreus Distant—det. H. G. Barber
on *Annona* sp. (I No. 1202), on maga (I No. 2883-B); swept
from grass at Bayamón (I No. 5460).

Lygus apicalis Fieber—det. W. L. McAtee
AMC: at Lajas iii-29.
on carrots (526-17), on weeds (428-17), at Vega Baja (I
No. 5555); on *Pluchea* at Pt. Cangrejos (I No. 5552); on
tender growth of *Inga laurina* at Lares (167-22).

Lygus fasciatus Reuter—det. H. G. Barber
on *Bidens pilosa* at Bayamón (I No. 5322).

Lygus olivaceous Reuter—det. H. G. Barber
on *Eugenia* flowers at Aibonito (I No. 4383).

Lygus sallei Stal
Gundlach.

Bolbosia deflexa Uhler MS—det. E. H. Gibson
from weeds in cane field (385-12), on *Commelina* at Cayey
(96-24).

Dolichomiris linearis Reuter—det. H. G. Barber
swept from grass at Villalba (I No. 3192).

Polymerus cuneatus Distant

(as *Pocilocyttus cuneatus* Uhler—det. W. L. McAtee) IP-245:
(311-12), on beans and tomatoes (200-16), on *Amaranthus*,
Verbesina alba and other weeds (427-17, 502-16), on carrots
(527-17); on tobacco at Cayey (37-16, 126-16); on sugar-
cane at Guánica (GNW). AMC: at Cayey.

(I No. 921 as *Myridus obscurus* Uhler—det. W. L. McAtee);
at light (I No. 4891); swept from weeds (I No. 2588 Leonard
33-132), at Loíza (I No. 3858), at Arceibi (I No. 4389), at Ca-
guas (I No. 5058), at Guayama (I No. 5003); on cotton at
Villalba (I No. 3198); on *Bidens pilosa* at Cidra (I No. 3577);
on *Solanum indicum* at Mayagüez (I No. 3249); on carrots
at Utuado (I No. 3727); on dahlia at Cidra (I No. 2619).

Creontiades rubrinervis Stal

AMNH at San Juan and Arceibo.

on cucumber (I No. 3354); on weeds at Garrochales (I
No. 5383).

Trigonotylus sp.—det. W. L. McAtee

abundant on Bermuda grass (262-21).

Collaria oleosa Distant

(as *Nabidea (Collaria) explicata* Uhler—det. W. L. McAtee)
IP-245: nymphs and adults on rice at Canóvanas (196-16);
on weeds (426-17).

AMC: at Manatí iv-29 det. H. G. Barber, Las Marías x-34,
Yauco x-30, Coamo Springs iv-32, Mayagüez xi-33.

on malojillo grass at Bayamón (I No. 2356 Leonard 33-
116); on *Solanum indicum* at Mayagüez (I No. 3239); on
ñame at Mayagüez (I No. 5836); on tomato at Bayamón
(I No. 4402).

ANTHOCORIDÆ

Orius (Triphleps) insidiosus Say

Barber 23-13: listed as *Triphleps*.

(312-12), on squash leaves (518-17), on corn, presumably predaceous on *Aphis maidis* Fitch (536-12 det. O. Heidemann), at Loíza (I No. 2185), at Barceloneta (I No. 3672); predaceous on red spider on beans (427-16); under leaf-sheaths of sugar-cane at Arecibo (1068-16 det. W. L. McAtee); at Isabela on cotton, presumably predaceous on red spider (214-21); on *Pluchea* at Pt. Cangrejos (I No. 5520); on flowers of *Bidens pilosa* at Guayama (I No. 5027).

Asthenidea picta Uhler ?—det. H. G. Barber

in buds of *Partium tiliaceum* at Arecibo (249-22); on grapefruit at Pueblo Viejo (I No. 2805-C).

Piezostethus sordidus Reuter—det. H. G. Barber

Barber 23-13: listed.

(as *Xylocoris*) AMC: at Joyuda xi-30 det. Barber.
on sliced grapefruit at Bayamón (I No. 5326).

Cardiastethus assimilis Reuter—det. H. G. Barber

Dozier 27-280: on *Ficus nitida*, predaceous on thrips.
on papaya at Arecibo (I No. 4678).

Macrotracheliella laevis Champion

Barber 23-13: listed.

feeding on thrips on *Ficus nitida* at Caguas (I No. 2167
Leonard 33-130).

Macrotracheliella nigra Parshley

Dozier 27-280: predaceous on thrips on *Ficus nitida*.

Lasiochilus divinus Champion

Wolcott 21-14: "The Pink Leafsheath Bug. All stages—under the older green leaf-sheaths of high cane." Illustration of adult. Leonard 32-139: mention.

under leaf-sheaths of sugar-cane (194-11, 201-11 det. O. Heidemann), possibly predaceous on mites, *Tarsonemus spinipes* Hirst (721-13), at Barceloneta (GNW—det. E. H. Gibson).

Lasiochilus fuscus Reuter—det. H. G. Barber

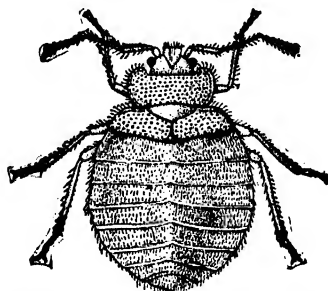
on decayed flower stalk on banana at Bayamón (I No. 2444
Leonard 33-132).

Lasiochilus pallidulus Reuter

* AMC: at Mayagüez ix-30 det. H. G. Barber.
at light (I No. 5595).

CIMICIDÆ

Cimex hemipterus F. = **C. lectularius** L.
(as *Acanthia*) Stahl, "chinche de cama".
Van Z. 1704).



Cimex hemipterus L. Greatly
enlarged. (After Murlatt.)

AMC: at nine localities.
in beds, hotel at Aibonito (342-23); (I No. 2999, 3598,
4421, 5715, 5717).

NABIDÆ

Neogorpis (as **Gorpis**) **neotropicalis** Barber 23-8: TYPE from
Aibonito, others from Adjuntas, P. R.

Carthasis gracilis Harris
Harris, H. M., "A Monographic Study of the Hemipterous
Family Nabidæ as it occurs in North America". Ent. Am.,
Vol. 9 (N. S.), Nos. 1-2, pp. 77-78. 1928: listed from P. R.

Carthasis minor Reuter (? = **C. rufo-notatus** Champion)
Barber 23-13: listed.

Nabis signatus Uhler
Barber 23-13: listed.

Nabis sordidus Reuter
Barber 23-13: listed.
(I No. 931 det. W. L. McAtee).

Pagasa fusca Stein
Barber 23-13: listed.

MESOVELIIDÆ

Mesovelgia mulsanti White, var **caraiba** Jacz.
(as sp.) Wetmore 16-41: eaten by Spotted Sandpiper.
Barber 23-13: listed, without variety.
at Isabela iii-35 (W. A. Hoffman).

REDUVIIDÆ

Heza pulchripes Stal

Barber 23-13: listed.

at light at Bayamón (I No. 3019); in grapefruit grove at Mayagüez (I No. 4235); on guava at Ponce (I No. 4631).

Heza sp. nov.—det. H. G. Barber

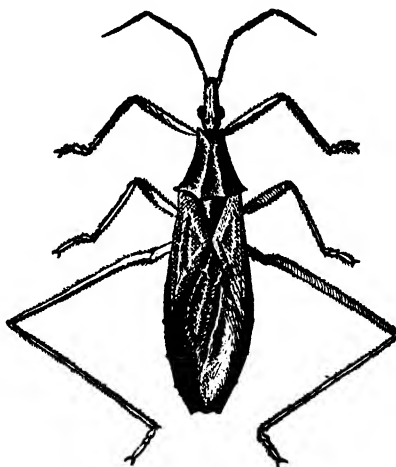
on *Crotalaria* at Mayagüez (I No. 5816).

Rocconota octispina Stal—det. W. L. McAtee

(as sp.) Wetmore 16-80: eaten by Petchary, *Tolmarchus taylori*.
resting on grapefruit (I No. 160).

Stenopoda cinerea Laporte

Stahl.



Stenopoda culiciformis F. Twice natural size. (Drawn by F. Maximilien.)

Stenopoda culiciformis F.

Gundlach.

AMC: at Luquillo vi-32, Coamo i-32, Mayagüez ix-30, v-31.
(284-12), at light (137-32).

Pnirontis infirma Stal—det. H. G. Barber

at light (I No. 5590), at Mayagüez (I No. 5831).

Zelus bilobus Say—det. W. L. McAtee

(I No. 903), on eggplant at Manatí (I No. 312); on pumpkin at Las Marías (I No. 470).

Zelus longipes Linnaeus

AMNH at San Juan.

Barber 23-13: listed.

AMC: at many localities.

(114-13), at Trujillo Alto (726-12); feeding on larvæ of

Haltica jamaicensis Fabr. 152-13); at Yabucoa with *Tachytes argentipes* Smith on it beak (158-16); in mountains north of Yauco feeding on *Alysis anulis* Cresson (43-23); at Aibonito (SSC); on pepper at Arecibo (I No. 1215 Leonard 32-143); at Loíza (I No. 3549); on grapefruit at Cidra (I No. 4113); on guava at Trujillo Alto (I No. 1601 Leonard 33-133).

Zelus rubidus Lap. & Serv.

(as *Evagoras tricolor* L. & S.) Stahl.

Gundlach.

AMC: at many localities.

Wetmore 16-77: eaten by Grey Kingbird, *Tyrannus domingensis*. Van Z. (5033) predaceous on cutworms and flies.

Jones 14-462: attacking the larvæ of *Laphygma frugiperda* S. & A.

Barber 23-13: in synonymy ? with *Z. longipes*.

(642-12, 144-17), eating *Diabrotica graminea* Baly and a small fly (180-11), eating a small fly (193-11), eating *Lucidota decorus* G. & H. (678-12); often common on spikes of *Achyranthes indica* waiting for flies to alight (GNW); on corn at Caguas (129-11 det. Heidemann); at Arroyo (12A-19); at Hatillo (123-18); at Yauco (772-15); on eggplant at Manatí (I No. 586); on sweet potato at Arecibo (I No. 2885).

Zelus subimpressus Stal

(as *Diplodus*) Gundlach.

Barber 23-13: listed.

on guava at Peñuelas (I No. 3034); in malojillo grass at Bayamón (I No. 2355 Leonard 33-116).

Zelus nugax Stal—det. W. L. McAtee

(as sp.) Wetmore 16-61, 77, 80: eaten by Ani, Kingbird and Petchary.

(58-11, 854-14), on sugar cane (325-12, 604-12), at Arecibo (635-21), at Toa Alta (454-21), at Rincón (GNW); on grass and weeds (236-16), at Pt. Cangrejos (GNW); on grapefruit foliage at Vega Baja (512-16), all stages at Vega Alta (102-177, 219-17); on *Inga laurina* at Lares (261-22); on coffee at Morovis (128-23).

Empicornis subparallelus McAtee & Malloch—det. H. G. Barber
at light (I No. 5591).

Rasahus hamatus F.

AMC: at Yabucoa vii-20 det. H. G. Barber.

Ploiaria gundlachi Dohrn

Barber 23-13: listed.

Ploiariodes barberi McAtee & Malloch (in Barber) 23-7: TYPE
from Tallaboa, P. R.

Ploiariodes armata Champion—det. W. L. McAtee

Barber 23-13: listed.

on foliage of grapefruit at Vega Alta (222-17).

Ploiariodes rubromaculata Blackburn—det. W. L. McAtee

Barber 23-13: listed.

feeding on thrips on foliage of *Spondias lutea* (728-16),

on mosquitoes on walls of house (622-16).

Emesa affinis longipes De Geer

Gundlach, determined by Dr. Uhler.

(as sp.) Wetmore 16-119: eaten by Mozambique.

Emesopsis nubilus Uhler—det. H. G. Barber

at light (I No. 5591).

Ghilianella apiculata McAtee & Malloch—det. H. G. Barber

on pomarossa leaf at Arecibo (I No. 5437).

Ghilianella varicornis (as **Emesa**) Dohrn, A., in *Linnae Entomologica*, Vol. 4, pp. 226-227. 1860: TYPE from P. R.

Westermannia tenerrima Dohrn, 60-227: TYPE from P. R.

Dohrn, A., "Beiträge zu einer Monographischen Bearbeitung der Familie der Emesina (part 2)." *Linnaea Entomologica*,

Vol. 5, pp. 226-227. 1863: re-description.

PHYMATIDÆ

Phymata erosa L.

Gundlach.

Phymata marginata F.

Gundlach.

(as *P. angulata*) Wetmore 16-61: eaten by Ani.

(as sp.) Wetmore 16-66, 98, 102, 114: eaten by Tody, Jamaican

Vireo, Prairie Warbler and Yellow-Shouldered Blackbird.

Barber 23-13: listed.

AMC: at Mayagüez v-33 det. Barber.

at Comerío (758-13 det. W. L. McAtee); on *Bidens pilosa*

at Cidra (I No. 3579); on pomarrosa at Villalba (I No. 4780);

on "lucar" flowers at Ponce (I No. 4694).

Macrocephalus crassimanus F.

Barber 23-13: listed.

on flowers of *Bidens pilosa* at Naguabo (I No. 5374).

Macrocephalus bergrothi Handl.—det. W. L. McAtee

on *Inga laurina* at Lares (155-22).

Macrocephalus gracilis Handl.—det. H. G. Barber

on *Inga laurina* at Adjuntas (I No. 4384).

Macrocephalus granulatus Champion—det. W. L. McAtee

(as sp.) Wetmore 16-66: eaten by Tody, *Todus mexicanus*.

on coffee at Lares (287-21).

Macrocephalus leucographus Westwood

Barber 23-13: listed.

Macrocephalus pulchellus Westwood

Barber 23-13: listed.

Macrocephalus sp. nov.—det. H. G. Barber

on guacima at Aibonito (I No. 5603); on ? at Yauco (I No. 5767); on *Inga laurina* at Adjuntas (I No. 3872); at Ponce (I No. 4606).

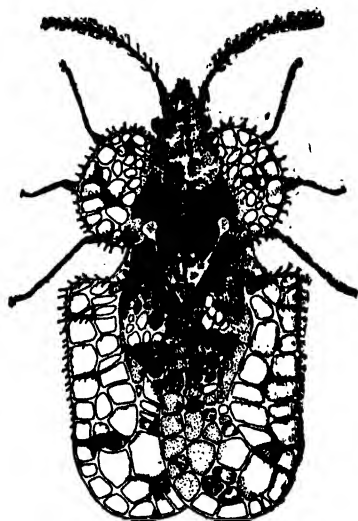
TINGIDIDÆ

Leptopharsa illudens Drake = **Atheas pallidus** Barber 23-6, TYPE from Arecibo, P. R.

(as *Atheas nigricornis* Champion—a misidentification according to Dr. Drake) Barrett 05-396: on cassava, *Manihot* sp.

EEWI-659: a pest only in P. R.

on "yuca", *Manihot* sp. (309-23 det. and synonymy by C. J. Drake).



Corythuca gossypii F. Twenty times natural size. (Drawn by F. Seán.)

Corythuca gossypii Fabricius—det. O. Heidemann

Van Z. (1254) on *Carica papaya*, *Anona muricata* and *Canavalia ensiformis*.

Jones 154: "breeds on the underside of yautía leaves, also---- of sword bean (*Canavalia ensiformis*) and castor bean (*Ricinus communis*)."

Cotton 18-313: on yautía.

Smyth 20-124: "on an occasional cotton leaf----more injurious to castor-bean and lima bean."

EEP-105: "La Chinche de la Yautía."

Barber 23-12: listed.

Leonard 31-146: mention.

Leonard 31-117, 32-122 & 33-119, 128: locality and host records.

Leonard, M. D., & Mills, A. S., "Observations on the Bean Lace Bug in Porto Rico." Jour. Dept. Agr. P. R., Vol. 15, No. 3, pp. 309-323, fig. 1, pl. 2, ref. 44. San Juan, September 1931.

Faxon & Trotter 32-445: on lima beans.

EEWI-435: on citrus.

AMC: at Ciales viii-33.

on sword bean (204-12), at Pt. Cangrejos (GNW—det. W. L. McAtee); on weeds at Pt. Cangrejos (I No. 5471); on castor bean at Ciales (783-13), at Luquillo (98-16); on yautía at Mameyes (810-12); on lima beans at Guayama (664-17), at Maleza and Isabela (151-31), at Palo Seco (I No. 325); scarce on cotton at Camuy (222-21); on papaya at Palo Seco (I No. 323), at Isabela (I No. 1990); on Myer lemon and orange at Isabela (150-31); on soursop at Maricao (I No. 336), at Isabela, Aguada, Cabo Rojo and Río Piedras (GNW); on grapefruit at Arecibo (I No. 2149); on breadfruit, *Artocarpus communis* (31-33).

Corythaica carinata Uhler—det. C. J. Drake

Barber 23-13: listed.

Drake: at San Juan, July 9-12, 1914.

on *Urena lobata* at Dorado (109-24 det. H. L. Dozier); on eggplant at Palo Seco (I No. 324 det. W. L. McAtee).

Corythaica planaris Uhler (= *C. monacha* Stal)—synonymy by S. C. Bruner: *monacha* the name in all records previous to 1930.

Van Zwaluwenburg 16-43: "very common on the under-leaf surface and on the topmost leaves of eggplant."

Jones 15-4: "all the foliage of eggplant withered----*Solanum torvum* also often attacked."

Cotton 18-297: "small, flask-shaped eggs in the tissue of the leaves----small wingless nymphs----attain adult form in about ten days after hatching. Controlled with soap and water spray."

Cotton, R. T., "The Eggplant Lace-Bug in Porto Rico" in Jour. Dept. Agr. P. R., Vol. 1, No. 3, July 1917, pp. 170-173: life history, descriptions of stages, natural enemies and control.

EEP-102: on eggplant.

Barber 23-12: listed.

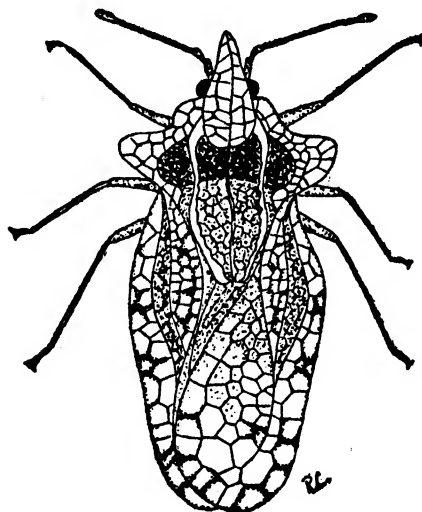
Wolcott 24-21: eaten by *Anolis pulchellus*.

Nolla 29-66: host of *Acrostalagmus aphidum*.

(as *C. planaris*) Leonard 32-132 & 33-115: locality and host records.

AMC: at Jayuya xi-30, Lajas v-29, and on many dates at Mayagüez.

on eggplant (533-12, 147-20), at Juncos (I No. 1773), at Garrochales (I No. 631); on *Solanum torvum* (359-12, 529-16), at Cayey (250-21), at Fajardo (469-12); on tobacco at Juncos (152-16); on cabbage at Ponce (I No. 2572).



Corythaica planaris Uhler. Twenty times natural size. (Drawn by R. T. Cotton.)

Monanthia c-nigrum Champion

AMC: at Joyuda ii-31.

Monanthia monotropidia Stal—det. W. L. McAtee

nymphs and adults abundant on underside of leaves of small unidentified tree in mountains north of Yauco (266-22).

Teleonemia prolixa Stal

Barber 23-13: listed.

AMC: at Algarrobo ii-31.

Teleonemia sacchari Fabricius

AMNH at San Juan.

Wolcott 24-31: eaten by *Anolis cristalelus*.
(750-14), on *Verbesina* flower (509-16).

Leptodictya bambusae Drake, Carl, in *Ohio Jour. Science*, Vol. 18, No. 5, March 1918, p. 175, TYPE from Mayagüez, Porto Rico: on bamboo.

Barber 23-13: listed.

PYRRHOCORIDÆ

Dysdercus andreae Linnaeus. The Common Cotton-Stainer or "Unión".

(as *D. suturellus* Herr. Sch.) Barrett 05-396: "caused considerable damage in a cotton field near Sabana Grande." May 06-11: mention.

Van Z. (P. R. 716). AMNH at Coamo, Guayanilla, Tallaboa.

Smyth 20-123: "more frequently found in the drier----sections, sometimes locally abundant,----not a serious pest of cotton."

EEP-64: on cotton, ordinarily not abundant.

Wolcott 24-56: at Boquerón.

Leonard 31-120 & 32-130: locality records.

Pastor Rodríguez 33-30: notes.

EEWI-288: distribution.

AMC: at Boquerón viii-33, vii-33, iii-30, ii-30; Seybo viii-27, San Germán xii-33, Yauco x-30, vi-32, Guayama iii-29, Coamo vii-30, Villalba x-30, Mayagüez iii-30, ix-30, i-30, xii-33, Isabela xii-29.

at light at Guánica (406-14): on cotton at Isabela (208-21), at Boquerón (21-33), at Guánica (251-17), at Guayanilla (GNW—det. B. Uvarov, thru Dr. Marshall), at Ponce (I No. 1404, 3111), at Aguadilla (132-31); adults and nymphs on crushed maga pods and seeds on ground (F. Seín, July 1935), at Isabela in May and June (113-32); on ground feeding on seeds from ceiba tree at Salinas (50-24).

Dysdercus neglectus Uhler—det. W. L. McAtee = *D. sanguinarius* Stahl—det. H. G. Barber.

EEP-64: a minor pest on cotton.

Wolcott 24-56: less abundant on cotton at Boquerón.

Barber 23-12: in synonymy with *D. jamaicensis* Walker.

Leonard 31-119 & 32-130: locality records.

Pastor Rodríguez 33-30: mention.

AMC: at Isabela xii-29, San Germán v-33, Mayagüez iii-27, iv-31.

on cotton at Quebradillas (186-22), at Vega Baja (295-22), at Algarrobo (194-22), at Boquerón (169-23).

Euryophthalmus obovatus Barber 23-5: (TYPE from Dominican Republic), others from Utuado, P. R.

AMC: at Cabo Rojo xii-30, Maricao xii-30, i-31, Utuado vii-30, viii-30 and on five dates at Mayagüez.

on ? at Mayagüez (I No. 5778); resting on orange at Penuelas (I No. 1956 Leonard 33-133).

Largus rufipennis Castelnau

Van Z. (P. R. 115.

Largus varians Stal—det. W. L. McAtee

Wolcott 24-32: eaten by *Anolis cristatellus*.

on coffee at Ciales (59-21, 258-23), at Lares (417-22); on Bromelid on *Erythrina glauca* at Cayey (352-22); on *Inga vera* at Cayey (298-23).

LYGAEIDÆ

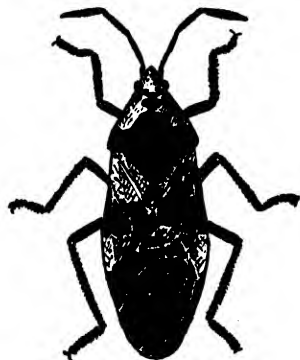
Oncopeltus aulicus F.

Van Z. (det. O. Heidemann). AMNH at Arecibo.

Barber 23-12: listed.

AMC: at twenty-six localities: Boquerón to Luquillo, Ponce to Aguadilla.

on milkweed, *Asclepias curassavica*, at Pt. Cangrejos (288-22), at Bayamón (225-22), at Comerío (759-13), at Vega Baja (517-16), at Vega Alta (50-17, 172-15); probably accidentally on Lantana at Arecibo (I No. 4947) and on *Crotalaria* at Dorado (I No. 3605).



Oncopeltus fasciatus Dallas.

Three times natural size.

(Drawn by F. Maximilien.)

Oncopeltus fasciatus Dallas

Barber 23-12: listed.

swept from weeds at Arecibo (I No. 2504 Leonard 33-132, 2941).

Lygaeus albonotatus Barber 23-2 to 3: TYPE from Mona Id.

Lygaeus bicrucis Say—det. W. L. McAtee

AMC: at Sabana Llana xii-30, Jayuya ix-30,, Ponce -31, Añasco x-30, Luquillo vii-32, and on thirteen dates at Mayagüez.

at light (615-12, 299-16), at Guánica (643-13, most abundant Oct. 8), at La Plata (GBM).

Lygaeus (? Melanostethus) coccineus Barber 23-3: TYPE from San Juan, P. R.

Lygaeus collaris F.

Stahl. Barber 23-12: as (*Melanocoryphus*).
at light at Bayamón (I No. 3049, 3052).

Lygaeus fasciatus Dallas

Stahl. Gundlach.

Lygaeus pallido-cinctus

AMC: at Boquerón i-29 det. W. L. McAtee, iii-29, Ponce vi-32,
Mayagüez xii-32, Luquillo vii-32.

Lygaeus (Ochrostomus) pulchellus F.

Barber 23-12: listed.

(presumably this sp.) abundant and mating on *Corchorus*
hirsutus at Pt. Cangrejos (70-16).

Ortholomus jamaicensis Dallas

(as *Nysius providus* Uhler) Uhler, "(Hemiptera-Homoptera of
Grenada, W. I." p. 182, 1894. (Van Z.)

Barber 23-12: (= *Nysius providus* Uhler, in part).

AMC: at Juncos xii-29 det. H. G. Barber, Algarrobo iii-31,
ii-30, xii-31, Yabucoa vi-30, Coamo xi-30, iv-31, iii-29, Ma-
yagüez v-30, ix-30, x-30.

on milkweeds at Bayamón (I No. 5538).

Nysius ericae Schilling

Barber 23-12: (= *Nysius scutellatus* Dallas ?)

Nysius basalis Dallas

Barber 23-12: (? = *Nysius inaequalis* Uhler)

Nysius spurcus Stal—det. E. H. Gibson

swept from weeds (349-17, 420-17); all stages common on
Hyptis pectinata (749-14).

Nysius strigosus Uhler—det. H. G. Barber

on *Pluchea* at Pt. Cangrejos (I No. 5474).

Cymonius (Ninus) notabilis Distant

(as *Ninus*—det. W. L. McAtee) IP-247: swept from grass
(453-16).

Barber 23-12: listed.

Ischnorrhynchus championi Distant

AMNH at Maricao.

Barber 23-12: listed.

on fresas at Aibonito (I No. 2934).

Cymus virescens F.

Barber 23-12: (= *Cymus breviceps* Stal).

on weeds at Pt. Cangrejos (I No. 5472); on mangrove at
Ponce (I No. 4602).

Ischnodemus sallei Signoret

AMC: at Barros x-30 det. H. G. Barber, Barranquitas xii-30, Río Piedras i-32, ii-31.

Blissus leucopterus Say

AMNH at San Juan. Barber 23-12: listed.

Wolcott 24-99: outbreak on guinea grass at Hatillo, apparently due to dry weather.

Wolcott 24-17, 26, 32: eaten by *Anolis pulchellus* (an important factor in control), *A. stratulus* and *S. cristatulus*.

EEP-45: a pest on guinea grass.

EEWI-220: control by lizards; attacking sugar-cane, rice, corn and pasture grass.



Blissus leucopterus Say.

Fifteen times natural size.

(After Webster.)

AMC: at Boquerón iii-29 (as var. *insularis* Barber det. H. G. Barber), Las Marias iv-30, San Juan xii-33, Mayagüez xi-30, Salinas xii-33.

(695-17) at Mayagüez (I No. 4563); on discarded cane stalks (714-12 det. E. H. Gibson); on injured cane shoots at Manatí and Vega Baja (nymphs—GNW); heavily infesting young plant cane at Hatillo (121-32 Miguel A. Díaz); on sugar-cane on Vieques Id. (GNW); on garden peas on Vieques Id. (var. *insularis* Barber I No. 1185 Leonard 32-135); abundant and causing injury to roots of Guinea grass at Hatillo (334-22), at Martín Peña (GNW); on malojillo grass at Pt. Cangrejos and at Carolina (5-30); constituting 10% of the food of the lizard, *Anolis pulchellus*, at Río Piedras (GNW).

Oedancala cubana Stal

Gundlach.

Geocoris lividipennis Stal

(as sp.) Wetmore 16-66: eaten by Tody, *Todus mexicanus*.

Barber 23-12: listed.

Ninyas deficiens Lethierry

Barber 23-12: (= *N. strabo* Distant).

Olerada apicicornis Signoret

Gundlach, "se encuentra en toda la isla".

AMC: at Barranquitas xii-30 det. H. G. Barber, Mayagüez xii-31, Algarrobo x-30, Yauco xii-34.
at Mayagüez (I No. 5838).

Ligyrocoris abdominalis Guerin

Barber 23-12: listed.

Paromius longulus Dallas

(as *Pamera*) Gundlach.

AMNH at Naguabo. Barber 23-12: listed.

AMC: at Mayagüez v-30 det. H. G. Barber, ix-30; Algarrobo x-30, iv-29, Añasco x-30, Lajas iii-29, Naranjito xi-27, Ponce vi-32.

(855-14), on grapefruit tree at Vega Alta (171-15), in grapefruit grove at Palo Seco (I No. 551); on *Crotalaria* at Dorado (I No. 2717-B, 2717-C. 2741): swept from weeds at Salinas (I No. 3124), at Villalba (I No. 3196-9).

Orthaea bilobata Say

(as *Pamera*) Van Z. (P. R. 717).

AMNH at Coamo. Barber 23-12: listed.

Wolcott 24-23, 26, 32: eaten by *Anolis krugii*, *A. stratulus* and *A. cristatulus*.

AMC: at Mayagüez vii-32, Coamo Springs ix-29.

swept from weeds (409-17, at Pt. Cangrejos (GNW), at Salinas (I No. 3124); all stages on *Piriqueta cistoides* (870-14); nymphs and adults feeding on seed capsules of *Portulaca oleracea* (523-16); on cotton at Isabela (158-21); on milkweed at Bayamón ((I No. 5539); on *Crotalaria* at Dorado (I No. 2717-D, 2717-E), at Arecibo (I No. 3656).

Orthaea (as *ferruginosa* preoc.) **intermedius** Barber 23-4: TYPE from Mayagüez, others from Maricao, Adjuntas, P. R.

Orthaea servillei Guerin

AMC: at Humacao xi-30 det. H. G. Barber, Mayagüez xii-30.

Orthaea vineta Say

(as *Pamera*) Gundlach.

Barber 23-12: listed.

AMC: at Mayagüez xi-30 det. H. G. Barber, viii-32.

on *Crotalaria* at Dorado (I No. 2717-E); on *Hibiscus* at Pueblo Viejo (I No. 2877); on grass at Villalba (I No. 3193), at Mayagüez (I No. 4563, 4825).

Ptochiomera minima Guerin

Barber 23-12: listed.

Pachygrontha parvula Barber 23-4: TYPE from Mona Id.

Ozophora burmeisteri Guerin

Barber 23-12: listed.

AMC: unlabeled specimen det. H. G. Barber, at Ponce vii-30, xii-33, Coamo Springs ix-30, Sabana Llana xii-30, Algarrobo x-30, ii-30, iii-31, and on ten dates at Mayagüez.
on *Crotalaria* at Dorado (I No. 2717-D).

Ozophora concava Distant

Barber 23-12: listed.

Ozophora sp. nov.—det. H. G. Barber

on grass at Bayamón (I No. 5464).

NEIDIDÆ

Jalysus spinosus Say

Barber 23-12: listed.

ARADIDÆ

Aneurus politus Say—det. H. G. Barber

AMC: undetermined spp.

in decaying wood at Adjuntas (I No. 5491).

COREIDÆ

Leptoglossus balteatus L.

(as *Anisoscelis thoracicus* Guerin) Stahl.

Barber 23-12. Gundlach.

on guava at Ponce (I No. 3116).

Leptoglossus gonagra F.

(as *Anisoscelis*) Stahl.

Gundlach. AMNH at San Juan.

Cotton 18-370, fig. 61: on squash; life-history notes.

EEP-121: on pumpkins. Barber 23-12: listed.

Leonard, M. D., "*Leptoglossus gonagra* Fab. injuring Citrus in Porto Rico". Jour. Ec. Ent., Vol 24, No. 3, pp. 765-767. Geneva, N. Y., 1931.

Colón 31-18, 123: in orange grove at Pueblo Viejo.

Faxon & Trotter 32-446: "damaging oranges and grapefruit by puncturing the fruit and extracting the juice, causing a corky area beneath the peel."

AMC: at Río Piedras i-32, Luquillo vi-32, Cayey xii-30, Coamo vi-30, Barranquitas xii-30, Utuado vii-30, Maricao xii-30, and on ten dates at Mayagüez.

on weeds in cane field (646-12, 748-12); on corn at Sabana Llana (127-15); on *Cleome spinosa* at Cayey (177-16); injuring oranges at Pueblo Viejo (I No. 1226 as "*gonager*", 2828, 3848); adults and nymphs feeding on guava fruit at Mayagüez (I No. 1496), at Arecibo (I No. 2939), at Peñuelas (I No. 3029).

Leptoglossus phyllopus L.

AMC: at Utuado vii-30 det. W. L. McAtee, Barranquitas x-33, xii-30, Luquillo vi-32, vii-32, Río Piedras v-32, San Germán xii-33, Cabo Rojo xii-30, and on ten dates at Mayagüez.

Leptoglossus stigma Herbst

(as *Anisoscelis serrulatus* Herr. Sch.) Stahl.

Gundlach. Barber 23-12: listed.

on guava at Trujillo Alto (I No. 1600 Leonard 33-117); at Cidra (I No. 1629); on achiote at Arecibo (I No. 4975).

Leptoglossus zonatus Dallas—det. E. H. Gibson

resting on guava at Ciales (784-13); attacking achiote pods at Adjuntas (8-25).

Phthia lunata F.

(as *Leptoscelis*) Stahl.

Gundlach. Barber 23-12: listed.

AMC: at Yabucoa vi-31, Adjuntas xii-33, Villalba vi-30, Jayuya ix-30, Utuado viii-30, and on six dates at Mayagüez.

Phthia picta Drury

Gundlach. Van Z. (det. O. Heidemann).

AMNH at San Juan. Barber 23-12: listed.

Jones 15-4, pl. 1, fig. 3: "Both adults and nymphs attack the fruit of tomato and *Solanum nigrum* var. *americanum*."

Cotton 18-311: "The bright-red wingless nymphs congregated in groups on developing (tomato) fruit and distort it with their punctures."

EEP-102, 120: on tomatoes, on pumpkin and melons.

AMC: at Ponce xii-33, Yauco ii-31, Coloso vii-32, Utuado viii-30, Jayuya xi-29, Yabucoa vi-30, and on twelve dates at Mayagüez.

on tomato (748-14, 185-16, 447-16, 542-16, I No. 1246 Leonard 32-141), a heavy infestation at Bayamón (I No. 4413); on *Solanum nigrum* var. *americanum* (716-14, 328-16, 521-16, 542-16, 563-16, 84-20), at Las Marías (I No. 1114); on weeds (239-12, 386-12, 489-12, 418-17), at Bayamón (I No. 5466), at Arecibo (I No. 2943); on cucurbits at Añasco (1032-13); on water-melon (I No. 274); on pumpkin at Las Marías (I No. 463); on *Physalis* (521-16); at light at Bayamón (I No. 5466).

Corecoris batatas F.

(as *Spartocera*) Van Z. (922) on sweet potatoes. AMNH at San Juan.

(as *Spartocera*) Jones 15-4, pl. 1, fig. 2: "Adults and nymphs -----in great abundance on sweet potato, their beaks imbedded in the stalks and leaf petioles." Wetmore 16-61, 98: eaten by Ani & Vireo.

(as *Spartocera fusca* Thunbg.) Cotton 18-310: economic notes. Barber 23-12: listed.

- (as *Spartocera*) EEP-123: on sweet potato.
 (as *Spartocera*) Wolcott 24-32: eaten by *Anolis cristatellus*.
 (as *Coreocoris* (*Spartocera*)) Dozier 26-115: life-history notes; killed by fungus *Sporotrichum gloeosporoides*, parasitized by *Trichopoda pennipes*.

Leonard 32-137 & 33-123: on Irish potatoes at Utuado, on sweet potatoes at Hato Rey and at Carolina.

(as *Spartocera*) EEW1-639: an economic account.

AMC: at Utuado viii-30, Mayagüez x-32, Moca xii-33, Lares vii-31, Yauco -34, Caguas xii-30, Sabana Llana xii-32, xii-30, Luquillo vi-23, vii-32.

on sweet potato (109-18), at Carolina (11-19), at Naguabo (47-14 det. O. Heidemann), at Hatillo (121-18), at Isabela (133-31), killed by dusting with calcium cyanide (F. Sein), but with some injury by burning to the host; adults on sugarcane (accidental) at Barceloneta (63-11); clusters of golden eggs abundant on bark of *Erythrina glauca* trees at Cayey (326-17), on posts (47-15, 137-16); adults on tomato at Bayamón (I No. 3752); on grapefruit at Manatí (I No. 4087); on ? at Añasco (I No. 2296 Leonard 33-132).

Coreocoris fusca Thunberg

(as *Spartocera*) Gundlach. Busek 00-90.

Barber 23-12: listed.

(as *Coreocoris* (*Spartocera*)) Dozier 26-116: eggs on posts, nymphs on Cundeamor vine at Humacao, descriptions of early stages, compared with those of *C. batatas*.

all stages abundant on eggplant (446-16, 508-16), on *Solanum nigrum* var. *americanum* (541-16), at Fajardo (464-12 det. E. H. Gibson as *Spartocera*), at Guayama (71-21), at Ponce (I No. 2824); on pepper at Vega Alta (I No. 1703 Leonard 33-121); on ? at Bayamón (I No. 1177 Leonard 32-142).

"*Coreocoris* (not *Coreocoris*) *fusca* commonly has the connexivum of the abdomen trans-fasciate with fuscous, but sometimes these markings are rather vague or missing. *C. fusca* has rather flaring, broader humeral angles of the pronotum, with the lateral margins more strongly impressed and, seen from above, concavely sinuated in the middle." H. G. Barber.

Sephina indierae Wolcott, IP-251: TYPE from "La Yndiera", mountains north of Yauco, P. R.

eight adults, in coitu, on parasite vine, *Metastelma* sp., June 16 (147-21 TYPE).

Chariesterus gracilicornis Stal

Gundlach. Barber 23-12: listed.

AMC: at Luquillo vi-32, vii-32, Sabana Llana xii-30, Río Piedras v-32, Ponce vi-32, Joyuda xi-30, Barranquitas xii-30, Algarrobo xi-30, Hormigueros vi-32, and on seventeen dates at Mayagüez.

at Añasco (I No. 4266), on milkweed at Bayamón (I No. 5535); on *Crotalaria* at Mayaguez (I No. 5812); on squash at Barceloneta (I No. 3262); on grapefruit at Añasco (I No. 1219 Leonard 32-143); on ñame at Isabela (I No. 5827).

***Chariesterus moestus* Burmeister**

Van Z. (det. O. Heidemann) (as *Corestus*) Stahl.

Wolcott 24-20: eaten by *Anolis pulchellus*.

from weeds (387-12), at Humacao (607-17 det. W. L. McAtee); from cucurbits at Añasco (1034-13): from *Amaranthus* at Yauco (385-21), at Toa Alta (GNW).

***Madura fusco-clavata* Stal**

AMC: at Mayagüez ii-27, ix-30.

***Margus obscurator* F.**

Barber 23-12: listed.

***Catorhintha borinquensis* Barber 23-1: TYPE from Coamo Springs, P. R.**

on weeds at Villalba (I No. 5702); on pomarrosa at Aibonito (I No. 5604).

***Catorhintha guttula* F.**

AMNH at Aibonito and Coamo.

Wetmore 16-61: eaten by Ani.

Barber 23-12: listed.

AMC: at Coamo iii-29 det. H. G. Barber, ix-29, iv-31, Yauco iii-29, xi-34, Cartagena Lagoon x-32, Ponce vi-32, Maricao xii-33.

swept from weeds at Humacao (671-17), at Dorado (I No. 2740), at Ponce (I No. 2580 Leonard 33-116); on húcar at Ponce (I No. 4494), abundant on sticky-capsule vine, *Commicarpus scandens*, at Aguirre (70-16); accidentally on sugarcane at Yauco (239-21), at Añasco (GNW); on *Crotalaria* at Dorado (I No. 2716).

***Anasa scorbutica* F.**

Barber 23-12: listed.

AMC: at Villalba vi-30 det. H. G. Barber, Juncos xii-29, Barranquitas xii-30, Utuado viii-30, Sabana Grande xii-30, and on eight dates at Mayagüez.

on squash at Vega Alta (I No. 1650 Leonard 33-132); on cucumber at Caguas (I No. 4864), at light at Bayamón (I No. 3020).

***Zioca taeniola* Dallas**

Gundlach. Van Z. (P. R. 116). Barber 23-12: listed.

AMC: at Coamo xi-30, Yauco xi-29, xi-30, San Germán xii-32, Hormigueros vi-32, Añasco x-30, and on ten dates at Mayagüez.

swept from weeds (417-17, 238-16), at Utuado (I No. 3127); on cucurbits at Añasco (1033-13); abundant on seed-beads of *Amaranthus* at Guánica (566-16); on cockscomb flower at Cidra (I No. 2909).

Sphictyrtus whitei Guerin (TYPE from Cuba)

AMNH from Mona Id. Barber 23-12: listed.

Van Z. (P. R. 701) from Mona Id. AMC: on Mona Id., v-21. common on Mona Id. (1303-13), adults feeding on corn, no nymphs or eggs noted by F. Seín (18-26).

Protenor tropicalis Distant—det. W. L. McAtee

AMC: at Mayagüez x- (as sp.) det. McAtee.

(one unlabeled specimen).

Leptocoris filiformis F.

Gundlach, "posible *L. tipuloides* DeGeer----sinónimo".

Barber 23-12: listed.

AMC: at Fajardo xii-29 det. H. G. Barber, Río Piedras i-32, v-32, Florida xii-30, Aguadilla xi-27, Lares i-31, San Sebastián x-32, Ponce i-31, Yauco xi-29, Añasco x-30, and on ten dates at Mayagüez.

in grapefruit grove at Palo Seco (I No. 549 as *tipuloides* DeG. det. W. L. McAtee), at Mayagüez (I No. 4233).

Hyalmenus longispinus Stal

Barber 23-12: listed.

Megalotomus rufipes Westwood

(as *Alydus pallescens* Stal) Gundlach.

(as *Alydus rufipes* Westwood) AMNH at Arecibo.

Wolcott 24-20: eaten by *Anolis pulchellus*.

Barber 23-12: listed.

AMC: at Algarrobo iii-31 det. H. G. Barber, x-30, Florida xii-30, Río Piedras v-32, Ponce vi-32, Sabana Llana xii-30, Aguadilla xi-27, Isabela, Boquerón iii-29, San Germán xii-33, Jayuya xi-27, and on four dates at Mayagüez.

on cowpeas (96-12), on gandul at Loíza (2-24); abundant on *Crotalaria* at Mayagüez (I No. 5811), at Dorado (I No. 2717, 5672); swept from weeds at Laguna San José (838-14 det. W. L. McAtee), at Algarrobo (769-14), at Añasco (I No. 4267).

Harmostes serratus F.

(as *Hyalmenus*) AMNH at Arecibo.

Barber 23-12: listed.

AMC: at Utuado viii-30, Algarrobo x-30, Mayagüez x-32. (I No. 929), on dahlia at Cidra (I No. 2618).

Exogenus extensus Distant

Barber 23-12: listed.

Corizus hyalinus F.—det. W. L. McAtee

Barber 23-12: listed.

Wolcott 24-21: eaten by *Anolis pulchellus*.

AMC: at Ponce vi-32, Yauco xi-34, Lajas xi-34, at Mayagüez ii-31 det. H. G. Barber, vii-32, x-32.

on weeds in garden and some feeding on tomatoes (237-16); on weeds at Bayamón (I No. 4426), at Añasco (I No. 4268); on tomatoes at Bayamón (I No. 3974), on eggplant at Caguas (I No. 1351 Leonard 32-133); on *Solanum indicum* at Mayagüez (I No. 3248).

Corizus sidae F.

Gundlach. Van Z. (933) on okra. Barber 23-12: listed.

(as sp.) Wetmore 16-61: eaten by Ani.

Wolcott 24-21: eaten by *Anolis pulchellus*.

IP-249: description of immature stages.

AMC: at Cartagena Lagoon i-32, x-32, Cabo Rojo xii-30, Lajas xi-29, v-29, Ponce vi-32, vii-30, Guayama iii-29, El Yunque iv-29, Algarrobo iii-31, ii-31, x-30, La Tortuguera iii-27, and at Mayagüez ii-27 det. H. G. Barber x-29, ix-29, ii-30.

swept from weeds (410-17) at Humacao (672-17 det. W. L. McAtee); common on *Amaranthus* flowers-heads (545-16); all stages abundant on *Waltheria americana* at Boquerón (17-23); in grapefruit grove at Palo Seco (I No. 547, 934); on wild morning glory at Ponce I No. 4753, 4754); on corn at Garrochales (I No. 5376); on milkweed at Bayamón (I No. 5537).

Jadera rubrofusca Barber 23-2: TYPE from Aibonito, others from Cayey, Manatí, Adjuntas, Ensenada, P. R.

on sea-grape at Dorado (I No. 5673); at light at Bayamón (I No. 4133); on húcar at Ponce (I No. 4622).

(Jadera aeola Dallas—det. W. L. McAtee

AMC: at Coamo Springs iv-32, iv-31, Algarrobo iii-31, Luquillo vii-32, Boquerón iii-30, San Germán v-33 and on seven dates at Mayagüez.)

"I do not believe that *Jadera aeola* Dallas occurs in Puerto Rico." H. G. Barber.

Jadera sanguinolenta F.

Gundlach, with *Serinettha coturnix* Burmeister in synonymy.

"Creo que coturnix es un sinónimo y no otra especie."

(as *Pyrrhotes*) Van Z. (P. R. 118).

(as *Serinettha coturnix* Burmeister) IP-250: at light (405-12 det. W. L. McAtee), at Pt. Cangrejos (GNW), at Humacao (54-13), abundant at Guánica (580-13, 1304-13).

Barber 23-12: listed.

PENTATOMIDÆ

Barber, H. G., & Brunner, S. C., "The Cydinidæ and Pentatomidæ of Cuba." Jour. Dept. Agr. P. R., Vol. 16, No. 3, pp. 231-285, pl. 3, fig. 1. San Juan, October 1932.

Megarisa semiamicta McAtee & Malloch—det. H. G. Barber.
on *Eugenia* flowers at Aibonito (I No. 4380).

Mormidea angustata Stål

Barber 23-12: listed.

AMC: at Barranquitas xii-30, Río Piedras i-32, Algarrobo iv-29, ii-31, and on seven dates at Mayagüez, two det. H. G. Barber.

on green peas at Bayamón (I No. 3236); on *Crotalaria* at Manatí (I No. 4393); on ñame foliage at Mayagüez (I No. 5888).

Mormidea cubrosa Dallas—det. H. G. Barber

at Bayamón (I No. 4427), on grass at Ponce (I No. 2581 Leonard 33-116); in grapefruit grove at Mayagüez (I No. 4234).

Mormidea guerini Lethierry & Severin

AMC: at Mayagüez det. H. G. Barber, Ponce xii-33.

Mormidea sordidula Stål

Barber 23-12: listed.

Mormidea ypsilon L.—det. W. L. McAtee

AMC: at Luquillo vii-32.

on grass in pasture at Guaynabo (724-17).

Solubea pugnax F.

(as *Pentatoma (Mormidea) typhaceus* F.) Stahl.

(as *Oebalus*) Gundlach.

IP-254: listed. Barber 23-12: listed.

on corn at Jayuya (I No. 2576).

Euschistus accuminatus Walker—det. H. G. Barber

on weeds at Ponce (I No. 4628).

Euschistus bifibulus P. B.—det. O. Heidemann

Van Z. (P. R. 709).

Cotton 18-280, 312: on beans and on tomato.

EEP-102: a pest on tomatoes.

EEWI-605: on beans.

AMC: at fifteen localities, on fourteen dates at Mayagüez.

on weeds (61-12, 388-12, 416-17), at light at Bayamón (I No. 3016); on *Gynadropsis pentaphylla* (501-12); on tomato (184-16), at Bayamón (I No. 3751); on beans (199-16, 342-17), at Bayamón (I No. 3446); on *Solanum nigrum* (296-16,

482-16, 520-16, 600-16), on *Solanum indicum* at Mayagüez (I No. 3238); on *Physalis angulata* (520-16, 600-16); on asparagus fern (87-19); on grapefruit foliage at Vega Alta (101-17); on cucurbits at Guánica (1030-13).

Euschistus crenator F.

AMNH at Coamo. Barber 23-12: listed.

(834-14), on beans at Palo Seco (I No. 321); on pepper at Arecibo (I No. 1365 Leonard 32-136).

Proxys victor F.

Van Z. (P.R. 117). (as sp.) Wetmore 16-61: eaten by Ani. Barber 23-12: listed.

AMC: at Luquillo vi-32; vii-32, Toa Baja xii-32, Jayuya ix-30, Yauco xii-32, San Germán xii-33, and on nine dates at Mayagüez.

on cucurbits at Añasco (1029-13); on squash vine at Vega Alta (224-17), at Vega Baja (I No. 3832); on grapefruit at Vega Baja (491-16); on weeds at Guayama (70-21), at Arecibo (I No. 3708), at Utuado (I No. 4634).

Proxys punctulatus P. B.

Gundlach.

(as *Pentatoma* (*Priononyx*) *punctata* P. B.) Stal.

Thyanta antiguensis Westwood

Van Z. (P.R. 718).

(as sp.) Wetmore 16-61, 75, 82, 89, 91, 93, 96: eaten by Ani, Black Swift, Flycatcher, Martin, Mockingbird, Thrush and Latimer's Vireo.

Barber 23-12: listed.

AMC: at Coamo Springs xi-30 det. H. G. Barber, Ponce vi-32, Lajas iii-29, San Germán xii-32, Faro de Cabo Rojo xi-30, and on six dates at Mayagüez.

on beans (568-16), on weeds (411-17); at Añasco (I No. 4265); at Guánica (503½-13, 1107-13); abundant on rice at Canóvanas (190-16).

Thyanta casta Stal

Barber 23-12: listed.

Thyanta perditor F.

(as *Mormidea*) Stahl.

Gundlach. Van Z. (P.R. 705). AMNH at Mayagüez.

Wetmore 16-58, 61, 89: eaten by Mangrove Cuckoo, Ani and Martin.

Barber 23-12: listed.

Wolcott 24-32: eaten by *Anolis cristatellus*.

AMC: at twelve localities.

on weeds (341-17), at Carolina (RTC), at Añasco (1109-13), at Vega Baja (510-16); on *Cleome spinosa* at Cayey (188-16); all stages abundant on *Piriqueta cistoides* (831-14

det. E. H. Gibson); on grapefruit at Dorado (I No. 4929); feeding on tomato fruit at Corozal (I No. 1340 Leonard 32-141); on lima beans at Loíza (I No. 1980, 2028); on *Crotalaria* at Naguabo (I No. 2438), at Mayagüez (I No. 5813).

Thyanta taeniola Dallas

AMC: at Ponce vi-32, Luquillo vi-32, vii-32, at Mayagüez x-19
det. H. G. Barber, vii-32, x-32.

Loxa flavicollis Drury

Gundlach. Van Z. (P. R. 720). Barber 23-12: listed.
at light (238-12, I No. 63), at Carolina (1045-16).

Loxa planifrons Barber & Bruner 32-260: (TYPE from Cuba), others Mameyes, Santurce and Pt. Cangrejos, P. R., "readily distinguished by the absence of longitudinal ridges on the head and by the distinct rugosity of the venter".

on cotton at Pt. Cangrejos (551-22 PARATYPE), at light at Bayamón (I No. 3018).

Vulsirea violacea F.—det. H. G. Barber

on ? at Ponce (I No. 4621).

Fecelia minor Vollenhoven

Barber 23-12: listed.

on sour orange at Arecibo (I No. 1721, 4976), at Peñuelas (I No. 1955, 1957, 2207), at Ponce (I No. 1959).

Nezara viridula L.

(as *Pentatoma smaragdula* F.) Stahl.

(as sp.) Wetmore 16-61, 77, 80, 82, 98: eaten by Ani, Kingbird, Petchary, Flycatcher and Jamaican Vireo.

Van Z. (P. R. 704). AMNH at Tallaboa.

EEP-102: a pest on tomatoes. Barber 23-12: listed.

Wolcott, G. N., "Common Insect Pests Prefer Other Host Plants in Haiti". Jour. Ec. Ent., Vol. 20, p. 430. Geneva, N. Y.,

April 1927: rare on tobacco in Porto Rico, common in Haiti. Leonard 33-113: on *Crotalaria*.

AMC: at twenty localities.

(I No. 897), on tomato (I No. 3765, 1245 Leonard 32-141), at Jayuya (I No. 4627), at Loíza (I No. 4880); on eggplant at Manatí (I No. 316); on *Cleome spinosa* (500-12); on cowpeas (91-12), on beans (785-14); on lima beans (I No. 1641), at Loíza (I No. 1979); on pigeon peas at Las Marías (I No. 1424), egg-clusters on pigeon peas at San Germán (I No. 1752); on cassava at Lares (I No. 2305); nymph on papaya (I No. 2003 Leonard 33-121); on *Crotalaria* at Naguabo (I No. 2437); on Irish potato at Cidra (I No. 1851 Leonard 33-123); on pepper at Arecibo (I No. 1364 Leonard 32-136), on okra at Trujillo Alto (I No. 1409); on squash at Vega Alta (I No. 1651); at Añasco (1031-13); on sugar-cane (acci-

dental) at Humacao (53-13); on coffee at Lares (311-21); on tobacco at San Lorenzo and reported as causing damage (11-21); on Vieques Id. (GNW); on Mona Id. (1319-13).

Acrosternum marginatum P. B.

Gundlach. Van Z. (P.R. 113). AMNH at Tallaboa.
(as *Nezara viridula* L.) Cotton 18-312: "on tomato".
Barber 23-12: listed.

AMC: at Algarrobo iii-31, Toa Baja xii-32, San Germán xii-33, and on five dates at Mayagüez.

at light at Bayamón (I No. 3017); at Guánica (1071-13); at Isabela (134-31); on tomato (186-16, 348-17); on tobacco at Juncos (154-16); on lima beans at Isabela (134-31 Leonard 33-113); on *Crotalaria* at Mayagüez (I No. 5814).

Piezodorus guildingi Westwood

Cotton 18-280: on beans. AMNH at Arecibo.

EEW1-605: on beans. Barber 23-12: listed.

AMC: at Luquillo vi-32, Villalba iii-30, Jayuya xii-32, Ponce vi-32, Aguada xii-32, Río Piedras xii-30, and on four dates at Mayagüez.

on cowpeas (72-12, 177-12 det. E. H. Gibson), on beans (786-14, 159-16, 198-16, 564-16), at Bayamón (I No. 3445), on *Chamoecrista aeschinomene* (619-16, 707-16); at light at Guánica (1072-13); on pepper at Loíza (I No. 3550); on Vieques Id. (GNW).

Piezodorus tinctus Distant

Barber 23-12: listed. (as *Pentatoma*) Stahl.

Arvelius albopunctatus DeGeer

Gundlach. Van Z. (935) on tomato and *Solanum torvum*.

AMNH at Mayagüez. (as *Pentatoma*) Stahl.

Cotton 18-312: "on tomato". Barber 23-12: listed.

EEP-102: a pest on tomato.

Wolcott 24-12: eaten by *Ameiva exsul*.

AMC: at Humacao xi-30, Santurce xii-31, Bayamón x-30, Ciales i-32, Barros x-30, ix-30, Maricao xii-33, i-31, Cabo Rojo xii-30 and on five dates at Mayagüez.

on tomato (187-16), at Hatillo (119-18); on fruit of *Solanum torvum* at Mameyes (380-22), at Barranquitas (402-22); on bean at Palo Seco (I No. 321); on pepper at Corozal (I No. 1291 Leonard 32-136); on grapefruit at Mayagüez (I No. 626).

Edessa bifida Say

Gundlach. AMNH at Arecibo. Barber 23-12: listed.

(as *Aceratodes cornuta* Burm.) Stahl.

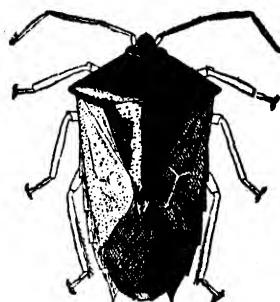
(as *E. cornuta* Burm.) Van Z. (P. R. 119).

(as sp.) Wetmore 16-61: eaten by Ani.

Wolcott 24-32: eaten by *Anolis cristatellus*.

AMC: at Montoso xi-32, Ponce xii-33, Adjuntas xii-33, Mayagüez xi-29, Río Piedras v-32, on El Yunque iv-29.

on sugar cane (accidental) (90-19), on weeds (136-12, 631-12, 738-12, 412-17), on morning-glory, *Ipomoea rubra*, nymphs and adults feeding on terminal shoots and tender stems (287-16, 291-16, 322-16, 611-16, 685-16, 63-20, 85-20); at Naguabo (728-14 det. as *E. cornuta* Burm. by Mr. Gibson); at Hatillo (120-18); on *Cassia* sp. at Sabana Llana (446-19), all following as *E. cornuta* Burmeister det. H. G. Barber: on orange leaf at Bayamón (I No. 514, 2378); in orange grove at Barceloneta (I No. 1762), at Adjuntas (I No. 3123); on malojillo at Bayamón (I No. 4425).



Edessa paravinula Barber.

Four times natural size.

(Drawn by G. N.
Wolcott.)

Edessa paravinula Barber, E. G., "A New Species of *Edessa* from Puerto Rico (Family Pentatomidæ)". Amer. Mus. Novitates No. 786, pp. 3. New York, March 30, 1935: TYPE from Aibonito, others from Arecibo, Cayey, Jayuya, Lares, Bayamón, Cidra, Adjuntas, Yauco, Utuado, Barros and Barranquitas, P. R., "very closely related to the Mexican species *E. vinula* Stal".

(as *Edessa* sp. (not *affinis* Dallas—compared with type in British Museum) IP-253: on coffee at Jájome Alto (369-21), at Aibonito (236-21), at Ciales (466-21, 80-22), at Corozal (457-21), at Utuado (478-21), at Lares (144-20, 322-21, 110-22), at Maricao (81-22), in the mountains north of Yauco (145-21, 114-22, 235-22); nymphs and adults on *Solanum torvum* in the mountains north of Yauco (262-22).

(as *Edessa affinis* Dallas—det. McAtee) Wolcott 23-46: on coffee. Wolcott 22a-5: illustration of adult.

(as *E. vinula* Stal) AMNH at Aibonito.

(as *Edessa vinula* Stal) AMC: at Barros x-30 det. H. G. Barber, Naranjito xi-27, Fajardo xii-33, Yauco ii-34, Cidra ii-32, Lares xii-32, Utuado xii-30, Maricao xii-30, xii-33, i-32, Barranquitas xii-30, and on four dates at Mayagüez.

on grapefruit at Arecibo (I No. 5439); at Bayamón at light (I No. 3015); on potato at Cidra (I No. 1848); on orange at Adjuntas (I No. 1958); on wild eggplant in the mountains north of Yauco (I No. 2660, 191-23).

Alcaeorrhynchus phymatophora P. B.

(as *Mutya*) Gundlach. Van Z. (P. R. 710).

Barber 23-12: listed.

AMC: at Mayagüez x-27 det. H. G. Barber, vi-31, Yabucoa vi-30, Caguas xii-32.

Mutya grandis Dallas

Van Z. (det. O. Heidemann).

(one unlabeled specimen—det. W. L. McAtee).

Pharypia pulchella Drury

Van Z. (P. R. 112).

AMC: at Mayagüez xii-30 det. H. G. Barber, vii-31, xii-32, Hormigueros x-32, Lajas xii-32.

(91-24 det. W. L. McAtee).

Podisus sagitta F.

Gundlach. Barber 23-12: listed.

Dexter 32-6: eaten by Surinam toad, *Bufo marinus*.

(832-14), at Aibonito (SSC—det. W. L. McAtee); resting on cotton at Boquerón (35-23), predaceous on larva of *Alabama argillacea* Hübner at Yauco (329-23); on weeds or malojillo at Bayamón (I No. 4428, 5465).

Podisus sculptus Champion—det. W. L. McAtee

on coffee leaves (726-17).

Podisus sp. nov.—det. H. G. Barber

on weeds at Ponce (I No. 4629).

Piezosternum subulatum Thunberg—det E. H. Gibson

IP-254. description of nymphs. Barber 23-12: listed.

AMC: at Yabucoa vi-30, Humacao ii-34, Caguas xii-32, Río Piedras i-32, xii-32, Montoso xi-32, Aguadilla xii-32, Utuado viii-30, xii-30, Las Marías xii-32 and on six dates at Mayagüez.

all stages on *Passiflora* sp. (937-13); on coffee at Lares (292-21), at Ciales (217-22); on tomato (I No. 5053); on *Xanthosoma* at Maricao (I No. 4232); on cundeamor at Pueblo Viejo (I No. 1696); on pea at Trujillo Alto (I No. 1850 Leonard 33-121); on grapefruit at Bayamón (I No. 2487); on breadfruit at Bayamón (I No. 4132).

CYDNIDÆ

Corimelaena (Eucoria) minuta Uhler

(as *Thyreocoris* (*Corimelaena*)) AMNH at Ponce. IP-256: on the ground among weeds at Pt. Cangrejos (GNW det. W. L. McAtee). Wolcott 24-3: four individuals in 3 sq. ft. of pasture at Pt. Cangrejos.
Barber 23-12: listed.

Aethus indentatus Uhler

(as *Rhytidiporus* det. W. L. McAtee) IP-256: at light (681-17), at Manatí (579-16). Wolcott 24-12: eaten by *Ameiva exsul*. Barber 23-12: listed.
AMC: at Mayagüez ix-30 det. H. G. Barber, x-30, xi-30; Coamo Springs xii-29, Maricao i-30, Algarrobo iii-31.
on dung at Adjuntas (I No. 5077).

Geocnethus reversus Barber & Bruner 32-237: TYPE from Mayagüez, others from Isabela and Río Piedras, P. R., "about the size and general appearance with *Aethus indentatus* Uhler--- (but) the absence of marginal spines on the head will serve to differentiate it".

Amnestus pusillus Uhler

Gundlach, "vuela a menudo hacia las luces encendidas en las casas".

Amnestus pusio Stal

Barber 23-12: listed.
at light at Bayamón (I No. 3060, 3827).

Amnestus subferrugineus Westwood

Barber 23-12: listed.

Amnestus sp. nov.—H. G. Barber

on coffee at Adjuntas (I No. 4009).

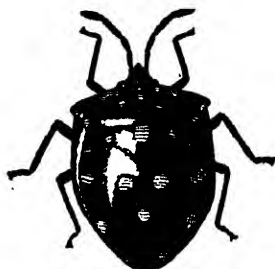
SCUTELLERIDÆ

Pachycoris torridus Scop.—det. E. H. Gibson

Smyth, E. G., "Un Insecto Extraño que Cubre su Cría lo Mismo que una Gallina" Rev. Agr. P. R., Vol. 2, No. 4, March 1919, 27-31, pl. 2: (an extraordinary insect which broods her young like a hen).

First instar nymphs are bright red, in following instars metallic green with orange-red dots; adults velvety blue-black with orange-red spots, the four largest on the abdomen often coalescing and in a few individuals extending over nearly the entire abdomen.

AMC: at Luquillo vi-32, Ponce xii-33, Quebradillas ix-29, Aguadillas xii-32, xii-31, xi-27, Adjuntas xii-33, Las Marias xii-33, xii-32, x-34, Utuado viii-30, Hormigueros vi-30, and on seven dates at Mayagüez.



Pachycoris torridus Scop.
Twice natural size. (Drawn
by F. Maximilien.)

on *Croton discolor* and *Lantana involucrata* at Ponce (112-13); on *Croton humilis* at Guánica (135-15), and on this and other species of wild *Croton* at Moca (708-14), Aguadilla (229-22), Hatillo (507-18).

***Pachycoris fabricii* L.**

(as *Scutellera nitens* Dallas) Stahl.
Gundlach. Barber 23-12: listed.
on guava at Cayey (I No. 3415).

***Sphyrocoris obliquus* Germar**
Gundlach.

***Diolcus boscai* F.—det. H. G. Barber**
Barber 23-12: listed.
at Yauco (706-14, 837A-14).

***Diolcus irroratus* F.—det. W. L. McAtee**

AMC: at Mayagüez x-32 det. H. G. Barber, x-30, Yauco iv-31, Ponce xii-33, vi-32, Quebradillas iv-29, Algarrobo iii-31, Vega Alta x-31, Salinas iii-29, Las Piedras iii-29, Luquillo vi-32, vii-32.

(I No. 4046); at Pt. Cangrejos (GNW); flying in grapefruit grove at Pueblo Viejo (457-16); on corn at Ponce (I No. 3226); on *Peirania* at Ponce (I No. 4623, 4626); on "mabi" at Mayagüez (I No. 4745).

(*Mesotrypa sinuosa* Uhler MS
Gundlach.)

***Augocoris illustris* F.**

(as *Scutellera cretacea* Voet.) Stahl.
(as *A. pallidus* H. S.) Gundlach.

Barber & Bruner 32-244: synonymy, "a specimen from P. R."
on *Phyllanthus epiphyllanthus* at Bayamón (740-13).

***Augocoris sexpunctatus* F.**

Barber 23-12: listed.

COLEOPTERA

LITERATURE

- Chevrolat, Aug.** Bull. Ent. Soc. France, Tome VII, Ser. V, pp. VIII-X. Paris. 1877.
- Quedenfeldt, G.,** "Neue und seltnere Kafer von Portorico." Berliner Entomologische Zeitschrift, Vol. 30, Part. 1, pp. 119-128, 1886.
- Leng, C. W. & Mutchler, A. J.,** "A Preliminary List of the Coleoptera of the West Indies as Recorded to Jan. 1, 1914." Bulletin American Museum of Natural History, Vol. 33, Art. 30, pp. 391-493, New York, Aug. 26, 1914.
- Leng, C. W. & Mutchler, A. J.,** 17-191 to 220 "Supplement to Preliminary List of Coleoptera of the West Indies." Bulletin American Museum of Natural History, Vol. 37, Art. 5, pp. 191-220, New York, Feb. 13, 1917. (Only the original records in this paper are noted in the following list; those from the papers of Gundlach, Van Zwaluwenburg and Jones are omitted, except when listed in synonymy under a different name.)

Dr. E. A. Schwarz, of the U. S. National Museum, has made most of the determinations of Coleoptera on which the original records here given are based, and if determination by him is not always specified, it is usually implied. To him for aid in the preparation of this list, the writer is most greatly indebted. Dr. A. D. Hopkins, of the Bureau of Entomology, has determined the Platypoidae and the Scolytidae, Mr. W. S. Fisher the Buprestidae and some of the Cerambycidae, Mr. R. H. Van Zwaluwenburg the Elateridae, Dr. R. T. Cotton most of the beetles affecting stored grain, and, at the time he was connected with the Bureau, Dr. W. Dwight Pierce some of the Curculionidae. Dr. Pierce also described the only species of Strepsiptera recorded from Porto Rico.

Mr. Andrew J. Mutchler, of the American Museum of Natural History, determined the Lampyridae and Cantharidae, and to him the writer is most grateful for references to literature not available in

Porto Rico and for suggestions (not all of them adopted) regarding the format of the list. Dr. A. B. Wolcott of the Field Museum at Chicago, described a Clerid from Porto Rico.

Sir Guy A. K. Marshall, Director of the Imperial Institute of Entomology, has determined many of the Curculionidae, and has described several new species from Porto Rico. To him the writer is also indebted for obtaining the determinations of several Chrysomelidae by Mr. G. E. Bryant, of Tenbrionidae by Mr. K. G. Blair and of *Lachnosterna* by Mr. E. S. Arrow.

In this revision, determination of the specimens recorded under Interception Numbers (I No.) have been made by Dr. E. A. Chapin, Dr. M. W. Blackman, and Messrs. W. S. Fisher, H. S. Barber and L. L. Buchanan.

CICINDELIDÆ

(To the American Museum of Natural History the compiler is indebted for permission to use in this section reproductions of illustrations from the paper by Messrs. C. W. Leng & A. J. Mutchler.)

LITERATURE

- Mutchler, A. J., "Descriptive Catalogue of West Indian Ci-
Leng, C. W. & cindelinae." Bulletin American Mu-
seum of Natural History, Vol. 35, Art.
36, pp. 681-699, pl. 1, figs. 5, New York,
October 17, 1916: illustrations of four
Porto Rican species and of alkali flat at
Santa Rita (Guánica) where some of
them were found.

***Tetracha sobrina* Dejean, var *infusata* Mannerheim**

(as *T. infusata* Chaudoir) Stahl. Gundlach.

Tower, W. V., in First Rpt. Bd. Comm. Agr. P. R., Jan. 1, 1912,
p. 20: attacking the changa, *Scapteriscus vicinus* Scudder.

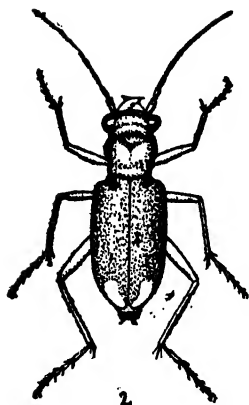
Leng & Mutchler. Leng & Mutchler 16-686: notes.

Dexter 32-5: eaten by the Surinam toad, *Bufo marinus*.

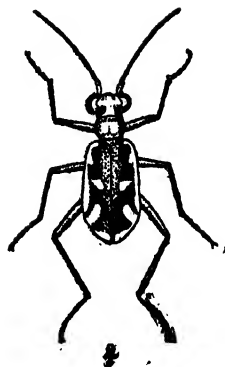
Danforth: at Río Piedras xii-30, Yabucoa vi-30.

AMC: at Luquillo vii-32, Barranquitas -32; others at Río
Piedras and Mayagüez.

(I No. 888, 747-12 det. E. A. Schwarz, 1028-16), at Caguas
(SSC), at Guánica (-13), at Arecibo (150-16); on ground
at night at Manatí (I No. 5884); at Bayamón in field where
cucumbers had been planted and the seed dug up (76-33).



Tetracha sobrina var. *infuscata*
Mann. (After Leng &
Mutchler.)



Cicindela boops Dejean.
(After Leng & Mutchler.)

***Cicindela boops* Dejean**

Leng & Mutchler 16-691: short description and notes.

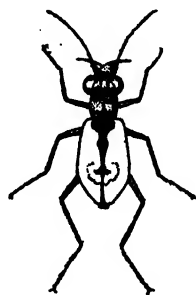
Danforth: at Faro de Cabo Rojo v-27, Aguadilla xii-32, Coamo
iii-29.

AMC: at Boquerón vi-32, Aguadilla xii-32.

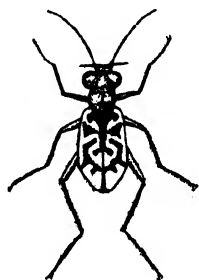
at Guánica, December 1913 (EGS), (I No. 5693).

***Cicindela suturalis* F.**

Leng & Mutchler 16-693: from P. R.



5
Cicindela suturalis
F. (After Leng
& Mutchler.)



6
Cicindela suturalis var.
hebraea Klug. (After
Leng & Mutchler.)

***Cicindela suturalis* F., var. *hebraea* Klug**

(as *C. hebraea* Klug) Gundlach. Stahl.

Leng & Mutchler 16-694: description and notes, at Añasco.
Danforth: at Camuy iv-29, Aguadilla xii-32.

AMC: at Camuy iv-29.

on the beach at Añasco Sept. 2, 1914 (EGS).

Cicindela trifasciata Fabricius

(as *C. tortuosa* Dejean) Stahl. Gunlach. Van Z. (P. R. 814).
Leng & Mutchler 16-692: notes.

Danforth: 16 records, at Mayagüez, Boquerón, Rincón, Aguadilla,
Coamo, Humacao, Yabucoa.

AMC: at San Germán xii-32 and many records from Mayagüez.
at Guánica, July 1913 (5GS), at Arecibo (147-13), com-
mon on sandy banks of stream at Maunabo (658-17), on the
beach at Pt. Cangrejos (GNW); at Pt. Picúa, Mameyes
(GNW); on ferry landing at Loíza Aldea (5-33).

CARABIDÆ

Mutchler, Andrew J., "New West Indian Carabidae from Puerto
Rico". Amer. Mus. Novitates No. 686,
pp. 5. New York, Jan. 6, 1934.

Darlington, Jr., P. J. "New West Indian Carabidae, with a List
of the Cuban Species". Psyche, Vol.
41, No. 2, pp. 66-131, pl. 1, ref. 5. Cam-
bridge, Mass., June, 1934.

Calasoma alternans Fabricius

Stahl. Gundlach. Leng & Mutchler.

Van Z. (P. R. 5061) attacking *Remigia repanda* Fabr. and lar-
vae of *Iachnosterna* spp.

Wetmore 16-61: eaten by Ani, *Crotophaga ani*.

Jones 13-235: probably predaceous on larvae of *Laphygma fru-*
giperda S. & A.

Dexter 32-6: eaten by Surinam toad, *Bufo marinus*.

Danforth and AMC: many records.

at light (88-21), at Arecibo (150-13), at Cayey (167-16),
at Guánica (572-13, 451A-14), in land being plowed at Guá-
nica (381-21); at Ponce (I No. 2670), at Vega Baja (I No.
3285).

Scarites montanus Mutchler 34-1: "TYPE from El Yunque, (P. R.),
may be the *Scarites subterraneus* Fabricius recorded by Stahl."

Dyschirius coamensis Mutchler 34-2: TYPE from Coamo Springs,
P. R.

Clivina addita Darlington 34-67: HOLOTYPE from Mayagüez, P. R.

Clivina insularis Duval

Danforth: at Mayagüez vii-32, det. Darlington.

at light (I No. 5596 det. L. L. Buchanan).

Ardistomis mannerheimi Putzeys

Leng & Mutchler.

Danforth: at Mayagüez vii-32 det. Darlington.

Aspidoglossa vulnerata Putzeys

(as *A. bipustulata* F.) Stahl. Gundlach.

Danforth: at Río Piedras ix-31 det. Darlington.

(as sp.) at Adjuntas (I No. 5857).

Morion monilicornis Latreille

(as *Morio*) Stahl. Gundlach. Leng & Mutchler 14-395.

(as *Morio*) Leng & Mutchler 17-195: from Culebra.

Panagaeus fasciatus Say

Gundlach.

Panagaeus quadrisignatus Chevrolat

Leng & Mutchler 17-195.

Danforth (and AMC): several records at Mayagüez det. Darlington.

at light (I No. 1012), at Bayamón (I No. 2606 Leonard 33-134), at Aibonito (SSC), at Guánica (det. Schwarz).

Bembidion darlingtoni Mutchler 34-3: TYPE from Ensenada, PARATYPE from Caguas, P. R.

Danforth: at Cartagena Lagoon iv-31 det. Darlington, many specimens from Coamo Springs iv-34 det. Darlington.

AMC: the same collections.

at Ponce (I No. 5622).

Bembidion sparsum Bates—det. P. J. Darlington

Danforth: at Coamo Springs iv-34.

Bembidion (Notaphus) fastidiosum LaFerte

(as *Bembidium* sp.) Wetmore 16-43: eaten by Semipalmated Sandpiper.

Darlington 34-77: specimen from P. R.

at Adjuntas (I No. 5614 det. as "sp.").

Tachys (Pericompsus) blandulus Schaum

(as *Pericompsus*) Leng & Mutchler.

Danforth: two specimens at Coamo Springs iv-34 det. Darlington.

Tachys ensenadae Mutchler 43-3: TYPE from Ensenada, others from Arecibo, P. R. and Vieques Id.

Danforth: at Río Piedras ix-31 det. Darlington.

at Ponce (I No. 5623), at Villalba (I No. 5807)—all det. as "sp." L. L. Buchanan.

Tachys macrodetrus Chevrolat

Gundlach.

Tachys piceolus LaFerte

Leng & Mutchler.

Tachys vitiger Leconte

Gundlach.

Tachys vorax Leconte—det. L. L. Buchanan
coll W. A. Hoffman.

Micratopus insularis Darlington 34-86: HOLOTYPE from San Juan, P. R., small head, length $1\frac{2}{3}$ mm.
at light (I No. 4390 as "sp.').

Trechius substriatus Chevrolat
Gundlach.

Lachnophorus leucopterus Chevrolat
Leng & Mutchler 17-194.

Danforth: at Mayagüez ii-31, det. both Mutchler and Darlington.

Casnonia insignis Chaudoir
Stahl. Gundlach.

Colliuris (Odacanthella) portoricensis Liebke, Mitt. Zool. Mus., Berlin, Vol. 15, p. 658, 1930: TYPE from P. R.
Darlington 34-123: record from P. R. and Haiti.
Danforth: at Mayagüez v-32 det. Darlington.

Galerita microcostata Darlington 34-124: HOLOTYPE from Mayagüez, P. R.
Danforth: at Quebradillas xii-33.

Zuphium americanum Dejean
Gundlach.

many unlabeled specimens, handwriting of person making the determination not recognizable.

Pseudaptinus insularis Mutchler 34-4: TYPE from Mayagüez, P. R.
Danforth: at Mayagüez viii-32 det. Darlington.
at light (I No. 5597).

Diaphorus thoracicus
AMC: at Mayagüez vii-32.

Lebia bitaeniata Chevrolat
Leng & Mutchler 17-195.
Danforth: at Río Piedras ix-31 det. L. L. Buchanan.

Lebia viridis Say
Leng & Mutchler 17-195.
Danforth: at Caguas xii-29 det. Mutchler.
(as *Lebia* 252-12, 645-17 "one specimen taken from cucumber vines (by RTC), it was probably feeding on aphids.")

Apenes marginalis Dejean
(as *Cymindis*) Gundlach, det. by M. Chevrolat.
Danforth: at Mayagüez i-28 det. Mutchler, xii-30, at Jayuya xii-31, Añasco xii-30, Naguabo vii-32.
at light (I No. 5597), (as "sp." 195-12, 437-17), at Luquillo (as "sp." RTC 203-13).

Apenes parallela Dejean

Danforth: at Coamo Springs v-29 det. Darlington.

Apenes variegata Dejean

Leng & Mutchler: recorded by Gundlach and Van Zwaluwenburg as *Cymindis* (probably the above).

Perigona sp.—det. L. L. Buchanan

on dead wood at Villalba (I No. 5705).

Perileptus sp.—det. L. L. Buchanan

at Ponce (I No. 5615).

Pentagonica bicolor Leconte

(as *Rhombodera atrorufa* Reiche) Gundlach.

(as *Rhombodera*) Van Z. (P. R. 802).

Danforth: at Mayagüez ix-32 det. Darlington. ix-30, v-32;

Coamo Springs iv-32 det. Darlington; Lajas xii-32.

AMC: at Mayagüez v-32.

at light at Bayamón (I No. 4136 det. as "sp." L. L. Buchanan).

Pentagonica divisa Darlington 34-121: HOLOTYPE from Yauco,

P. R., others from Mayagüez, Jayuya, Aguada, Boquerón and Bayamón.

Pentagonica flavipes Leconte

Danforth: at Mayagüez ix-30, xii-30 both det. Darlington.

Brachinus brunneus Castelnau—det. L. L. Buchanan

Danforth: at Mayagüez xii-28 det. Darlington, xii-32.

at Ponce (I No. 5609).

Brachinus gilvipes Mannerheim

Stahl. Gundlach.

Danforth (& AMC): at Mayagüez vii-30, Cartagena Lagoon i-29 both det. Mutchler.

Stenous metallicus Dejean—det. L. L. Buchanan

Danforth: at Cartagena Lagoon ii-27 det. Darlington as "near *metallicus*".

at Ponce (I No. 5612).

Stenocrepis (Stenous) tibialis Chevrolat

(as *Stenous*) Stahl. Gundlach.

(as *Stenous* sp.) Danforth 26-72 to 122: eaten by Least, Spotted, and Semipalmated Sandpipers, Lesser Yellowlegs, W. I. Killdeer and Northern Water Thrush.

Danforth: many records; at Coamo Springs iv-34 det. Darlington, Cartagena Lagoon ii-27 det. Leng, Mayagüez, Yauco, etc.

at light at Guánica (640-13 det. E. A. Schwarz).

Chlaenius perplexus Dejean

Danforth: at Mayagüez vi-32 det. Darlington, ix-30, at Luquillo vii-32.

Oodes femoralis Chaudoir

Stahl.

Masoreus (Aephnidius) ciliatus Mutchler in Darlington 34-130:

TYPE from Ensenada, P. R.

Selenophorus alternans Dejean

Gundlach. Danforth and AMC: many records; at Mayagüez xi-30 det. Darlington, at Florida vi-31 det. Darlington, Coamo Springs, Añasco, Río Piedras, Utuado, Humacao, etc.
at light (I No. 5599, 5886).

Selenophorus chalybeus Dejean

Danforth: at Coamo Springs ix-29 det. Darlington.

Selenophorus discopunctatus Dejean

Gundlach. Leng & Mutchler 17-194.

Danforth: at Aibonito ii-32 det. Darlington.

at light at Bayamón (I No. 3350).

Selenophorus flavilabris Dejean

Leng & Mutchler 17-194.

Selenophorus latior Darlington 34-109: PARATYPE from Pt. Cangrejos, P. R., "recognized by unusual width of prothorax at base".

Selenophorus parumpunctatus Dejean

Stahl. Gundlach.

Wolecott 24-3: one specimen in 3 sq. ft. of pasture at Pt. Cangrejos. (possibly *latior* Darlington.)

in sea-weed on the beach at Pt. Cangrejos (GNW); on ground at Jayuya (I No. 2519-B det. L. L. Buchanan).

Selenophorus parvus Darlington 34-105: HOLOTYPE from Coamo Springs, P. R., "resembles a small *S. sinuatus*."

Selenophorus puertoricensis Mutchler 34-5: TYPE from Desengaño, P. R., others from Mt. Manidos.

Selenophorus pyritosus Dejean

Stahl. Gundlach.

at light at Guánica (574-13 fourteen specimens).

Selenophorus sinuatus Gyllenhal

Danforth: at Cartagena Lagoon ii-27 det. Darlington.

Selenophorus striatopunctatus Putzeys

Danforth (& AMC): at Utuado vii-30 det. Darlington, Mayagüez iv-32, Coamo Springs ix-30, Ensenada ii-29.

Selenophorus sp.

Wetmore 16-39, 61, 91 : eaten by Killdeer, Ani and Mockingbird.

Wolcott 24-29 : eaten by *Anolis cristatellus*.

(I No. 5224), at Adjuntas (I No. 5205).

Gynandropus guadeloupensis Fleutiaux

Danforth : at Humacao xi-30 det. Darlington.

AMC : at Mayagüez ix-30, Humacao xi-30.

Bradycellus (Stenocellus) velatus Darlington 34-111 : PARATYPES from Río Piedras, P. R.

Danforth : one of the paratypes.

Stenolophus ochropezus Say

Danforth : at Río Piedras ix-31 and Coamo iii-29 both det.

Darlington, also as *Acupalpus*, at Mayagüez xii-29 det. Darlington, at Yauco ii-30, Jayuya viii-30.

HALIPLIDÆ

Haliplus sp.—det. E. A. Schwarz

at light at Manatí (228-16).

DYTISCIDÆ

Hyphydrus obniger Chevrolat

Gundlach.

Laccophilus proximus Say (o *sambi americanus* Aubé) Stahl.

Stahl. Gundlach.

Danforth (& AMC) : many records; at Cabo Rojo xi-30 det.

Mutchler, at Luquillo vii-32, etc.

in water at Ponce (I No. 5742 as "sp.").

Pachydrus globosus Aubé

Leng & Mutchler.

Danforth : at Mayagüez vi-29 det. Mutchler, Lajas xii-32, Hu-

macao xi-30, Cartagena Lagoon x-27.

Pachydrus brevis Sharp—det. E. A. Schwarz

at light at Vega Alta (162-15).

Hydrocanthus iricolor Say

Danforth : at Cartagena Lagoon x-27 det. Mutchler.

at light (I No. 5596 as "sp.").

(Hydroporus) exilis

Stahl.)

Copelatus angustatus Chevrolat

Gundlach. Danforth : at Mayagüez vii-31, vi-32, Luquillo vi-32.

(as sp.) Wetmore 16-84, 87 : eaten by Wood Pewee and Cliff Swallow.

(676-16 det. E. A. Schwarz.)

Copelatus posticatus F.

Danforth: at Cartagena Lagoon xi-30 det. Mutchler, Cabo Rojo xi-30, Humacao xi-30, Luquillo vii-30, many at Mayagüez.

Thermonectes circumscriptus Latreille

(as *Acilius*) Gundlach.

Wetmore 16-22: eaten by Green Heron.

Leng & Mutchler 17-196: recorded by Gundlach.

Danforth: at Mayagüez x-30 det. Mutchler, Orocovis x-30, Trujillo Alto i-31.

in small stream at Espinosa (506-17 det. E. A. Schwarz).

Thermonectes margineguttatus Aubé

(as *Acilius*) Gundlach.

Leng & Mutchler 17-196: recorded by Gundlach.

Danforth: at Mayagüez xii-28 det. Mutchler, Humacao xi-30,

Cabo Rojo xi-30, Cartagena Lagoon xi-30.

Megadytes fraternus Sharp

(as *Cybister laevigatus* Fabr.) Stahl. Gundlach.

Leng & Mutchler 17-196: recorded by Gundlach.

Danforth: at Cabo Rojo xi-30 det. Mutchler, etc.

at light at Guánica (1050-13 det. E. A. Schwarz), crawling over mud near stream (31-17).

Megadytes giganteus Castelnau

(as *Cybister l'herminieri* Guerin) Stahl. Gundlach.

Leng & Mutchler 17-196: recorded by Gundlach and Van Zwaluwenburg.

Danforth: at Algarrobo ii-31 det. Mutchler, Humacao xi-30, Mayagüez v-32.

at light (I No. 3128).

GYRINIDÆ

Ochs, G.,

"On the West Indian Gyrinidae and a New Species of *Gyretes* from Northern Brazil". Amer. Mus. Novitates No. 125, pp. 8. New York, July 24, 1924.

Ochthelous sp. nov. ?

Danforth: at Cabo Rojo xi-30 det. Mutchler.

Dinutus (Dineutes) metallicus Aube

Stahl. Gundlach. AMNH.

Ochs 24-4: at San Juan, Quebradillas and Coamo Springs.

Danforth: at Coamo iii-29 det. Mutchler, Río Piedras xii-31,

Lajas xii-32, Aguadilla xii-32, Bayamón xii-32.

AMC: eleven records.

Dinutus (Dineutes) longimanus Olivier var. **portoricensis** Ochs 24-5:

TYPE (of subsp.) from Aibonito, P. R., others from Coamo Springs, Barros, Adjuntas, Utuado and Consumo.

Gundlach.

Danforth: at Las Marías x-28 det. Mutchler, Maricao vii-32, Cidra ii-32, Mayagüez v-28, Utuado xii-32, and many other records.

AMC: twenty-five specimens from many localities.
in stream at Aibonito (677-16 det. E. A. Schwarz).

Gyrinus rugifer Regimbart

Ochs 24-3: notes.

Danforth (& AMC): at Las Marías iv-29 det. Mutchler, Maricao iii-29, Bayamón xii-32.

HYDROPHILIDÆ

Ochthebius sp. nov.—det. E. A. Schwarz

at Santa Isabel, flying in great abundance in early morning (121-13).

Enochrus sp.—det. L. L. Buchanan

at light (I No. 5596), at Ponce (I No. 3875), in water (I No. 5741), at Mayagüez (I No. 4994).

Hydrochus pallipes Chevrolat

Gundlach.

(as sp.) Wetmore 16-66: eaten by Tody, *Todus mexicanus*.

Berosus tessellatus Fleutiaux

Danforth (& AMC): at Cartagena Lagoon xi-27 det. Mutchler, Coamo Springs ix-29, Añasco x-30, Algarrobo iii-31, Cabo Rojo xi-30.

Berosus sp.

Wetmore 16-24, 39, 41, 42, 66, 67, 84: eaten by Blue Heron, Sandpipers, Tody and Cliff Swallow.

Danforth: at Mayagüez ix-30 det. Mutchler, Río Piedras i-31, etc.

Hydrophilus (Hydrous) tenebriodes Jacq. Duval

(as *Hydrous*) Stahl. Gundlach.

(as sp.) Wetmore 16-24: eaten by Little Blue Heron.

Danforth: at Mayagüez xi-28 det. Mutchler, and many other dates, Yauco xi-31, Añasco x-30, Villalba x-30, Orocovis x-30, etc.

at light (663-17, 291-22), at Pt. Cangrejos, (GNW), at Santana (215-16), at Guánica (1147-13 det. Schwarz).

Stethoxus insularis Castelnau

(as *Hydrophilus*) Stahl. Gundlach.

Leng & Mutchler 17-197.

Stethoxus intermedius Jacq. Duval

(as *Hydrophilus*) Stahl. Gundlach.

(as *S. ater* Olivier) Wetmore 16-24: eaten by Little Blue Heron.
(in synonymy with *S. ater* Olivier) Leng & Mutchler.

Leng & Mutchler 17-196: from Culebra Island. According to Mr. F. Wintersteiner "not identical with the Central American species *ater* (Olivier)."

Dexter 32-6: eaten by Surinam toad, *Bufo marinus*.

AMC: at Mayagüez on 19 dates, Carolina iv-31, Yabucoa i-30, Ponce ix-30, Yauco ii-31, San Germán xii-33.

at light (36-10 det. Schwarz), at Aibonito (SSC); at light at Ponce (I No. 3622 det. as *Hydrous ater* Oliv. by L. L. Buchanan), at Bayamón (I No. 3106).

***Tropisternus collaris* Fabricius**

Stahl. Gundlach.

Wetmore 16-22, 87: eaten by Green Heron and Martin.

Van Volkenberg, H. L., "Report of the Parasitologist". in P. R. (Mayagüez) Agr. Expt. Station Report 1930, pp. 38-40. Washington, D. C., 1932: host of tapeworm cysticercoid.

Van Volkenberg 32-27: "an apparently important host of the thorny-headed worm, *Macracanthorhynchus hirudinaceus*, of swine".

Danforth: at Cartagena Lagoon x-27 det. E. A. Chapin, Coamo Springs ix-29, Luquillo vi-32, Mayagüez on many dates, etc.

AMC: many records.

at light at Bayamón (I No. 2808).

***Tropisternus chalybeus* Castelnau**

Leng & Mutchler 17-192.

(as sp.) Wetmore 16-63: eaten by Woodpecker.

(I No. 936 det. W. S. Fisher).

***Tropisternus lateralis* Fabricius**

Stahl. Gundlach.

(as *T. nimbatus* Say) Wetmore 16-24: eaten by Little Blue Heron.

Danforth: at Cabo Rojo xi-30 det. Mutchler, Algarrobo ii-30, Jayuya ix-30, Mayagüez on many dates, etc.

AMC: many records.

in pool of water (32-17 det. E. A. Schwarz, 711-16).

***Philhydrus melanocephalus* Fabricius**

Gundlach. (as sp.) Wetmore 16-39: eaten by Killdeer.

***Philhydrus nebulosus* Say**

Leng & Mutchler 17-197.

Danforth: at Yauco x-29 det. Mutchler, Mayagüez ix-30 det.

Mutchler, Mayagüez ix-30 det. Mutchler, Cabo Rojo xi-30,

Rio Piedras vii-31, Santa Isabel xii-28, Humacao xi-30, etc.

AMC: also at Yauco v-25, Florida v-31.

***Philhydrus ochracea* Melsheimer**

Leng & Mutchler 17-197.

***Dactylosternum advectum* Horn**

Leng & Mutchler 17-197.

Dactylosternum abdominale F.

Danforth: at Mayagüez xi-28 det. Mutchler.

(as sp.) Wolcott 24-23: eaten by *Anolis krugii*.

at light at Bayamón (I No. 3362 det. L. L. Buchanan), at Mayagüez (I No. 2344 Leonard 33-132); in rotten flower stalk of banana at Bayamón (I No. 2630).

Dactylosternum flavicorne Mulsant

(as *Cyclonotum*) Stahl. Gundlach.

common under bark of decaying bucare tree, *Erythrina glauca*, at Cayey (302-17 det. as "sp." E. A. Schwarz).

Dactylosternum picicorne Mulsant

Danforth: at Mayagüez xi-28 det. Mutchler, Río Piedras i-31, Yabucoa vi-30, etc.

AMC: also at Ponce-31, Luquillo vi-32.

Oosternum costatum Sharp.

Leng & Mutchler 17-197.

on *Inga laurina* pods at Juana Díaz (I No. 5074-B); in dung at Adjuntas (I No. 5086).

Phaenonotum estriatum Say—det. E. A. Schwarz

Danforth: at Mayagüez vi-29 det. Mutchler, Cartagena Lagoon ii-27, Río Piedras x-29, Coamo iii-29, Naguabo vii-32, etc.

AMC: many records.

Wolcott 24-17, 25: eaten by *Anolis pulchellus* and *A. stratulus*. at light (455-16, at Bayamón (I No. 3346, 3347, 4209); in stomach of lizard (297-23); common on cane trash at Areibo (1069-16).

Cercyon sp.

Wetmore 16-87: eaten by Cliff Swallow.

Danforth: at Ponce vi-30 det. Mutchler, Río Piedras xi-31. in dung at Adjuntas (I No. 3989, 5619).

SILPHIDÆ

Aglyptinus sp.—det. W. S. Fisher

from pods of *Inga laurina* at Juana Díaz (I No. 5075).

Choleva sp.—det. W. S. Fisher

on El Yunque (I No. 5923).

SCYDMANIDÆ

Euconnus coralinus Reitter

Leng & Mutchler.

on dead wood at Villalba (I No. 5735 as "sp.').

Euconnus testaceus Schaum

Leng & Mutchler.

Napochus tantillus Reitter
Leng & Mutchler.

Napochus amoënus Reitter
Leng & Mutchler.

STAPHYLINIDÆ

Erichson, W. F., "Genera et Species Staphylinorum Insectorum Familæ", pp. 954. Berlin, 1839-1840: descriptions of twenty-six species from P. R.

Piestus erythropus Erichson
Stahl.

Lispinus attenuatus Erichson
Leng & Mutchler.

Lispinus laticollis Erichson
Leng & Mutchler.

Anacæus exiguus Erichson
Leng & Mutchler.

Thoracophorus denticollis Erichson
Leng & Mutchler.

Ornallium pedicularium Erichson
Leng & Mutchler.

Trogophloeus aridus Jacq. Duval
Gundlach.

Trogophloeus fulvipes Erichson
(as *T. aequalis* Jacq. Duval) Gundlach.
Leng & Mutchler.

Holotrochus cylindricus Erichson
Leng & Mutchler.

Pinophilus flavipes Erichson
Leng & Mutchler.
Ranforth (& AMC): at Humacao xi-30 det. Mutchler.

Pinophilus latipes Gravenhorst
Stahl. Gundlach.

Palaminus lengi Notman, Howard, "New Species of **Palaminus** from the West Indies, together with a Synoptic Review of the Genus". Amer. Mus. Novitates No. 386, pp. 17. New York, Nov. 27, 1929: TYPE from Adjuntas, P. R.

Palaminus parvipennis Notman 29-14: TYPE from El Yunque, P. R., others from Loiza.

Palaminus bifidus Notman 29-14: TYPE from El Yunque, others from Aibonito and Adjuntas, P. R.

Palaminus scitulus Notman 29-15: TYPE from Aibonito, P. R.

Palaminus pusillus Notman 29-15: TYPE from El Yunque, P. R.

Palaminus grandicollis Notman 29-16: TYPE from Aibonito, other from Adjuntas, P. R.

Palaminus procerus Notman 29-16: TYPE from Aibonito, P. R.

Palaminus insularis Cameron
Notman 29-17: at Aibonito.

Stilicopsis exigua Erichson
Leng & Mutchler.
on cucumbers at Jayuya (I No. 3735 det as "sp." E. A. Chapin).

Lithocharis dorsalis Erichson
Leng & Mutchler.

Lithocharis ochracea Gravenhorst
Gundlach.

Lithocharis posticata Erichson
Leng & Mutchler.

Scopaeus fasciatellus Erichson
Leng & Mutchler.

Scopaeus pygmaeus Erichson
Leng & Mutchler.

Cryptobium albipes Erichson
Leng & Mutchler.

Cryptobium fulvipes Erichson
Leng & Mutchler.

Paederomimus lustralis Erichson
Leng & Mutchler.

Philonthus alumnus Erichson
Leng & Mutchler.

Philonthus havaniensis Castelnau
Leng & Mutchler.

Philonthus humilis Erichson
Leng & Mutchler.

Belonuchus gagates Erichson
Leng & Mutchler.
on orange fruit at Ponce (I No. 2659).

Xantholinus attenuatus Erichson
Leng & Mutchler. Merrill 15-54: in fresh cow dung.
(as sp.) Wolcott 24-17, 29: eaten by *Anolis pulchellus* and *A. cristatellus*.
at Guánica (542-13 det. E. A. Schwarz).

Cilea hepatica Erichson
Leng & Mutchler.

Cilea rutilus Erichson
Leng & Mutchler.

Cilea pulchellus Erichson
Leng & Mutchler.

Erchomus piceus Erichson
Leng & Mutchler.

Erchomus apicalis Erichson
Leng & Mutchler.

Erchomus nitidulus Erichson
Leng & Mutchler.

Coproporus (as **Erchomus**) **rutilus** Sharp, David, "Biología Centrali Americana—Coleoptera. Nitidulidae". Vol. 1, No. 2, p. 304.
1890: TYPE from St. Thomas and P. R.

Coproporus terminalis Erichson
Leng & Mutchler.

Bolitobius obscurus Erichson
Leng & Mutchler.

Gyrophæna sp.—det. E. A. Schwarz
common on a fungus, *Daedalea amanitoides* (1221-13).

Aleochara sp. nov.—det. E. A. Schwarz
in cow dung at Guánica (GBM).

Hoplandria terminata Erichson
Leng & Mutchler.

PSELAPHIDÆ

Acratrichis atomaria DeGeer
Leng & Mutchler.

Acratrichis haldemanni Leconte—det. H. S. Barber
on *Inga vera* at Ponce (I No. 3795); under dung at Ponce
(I No. 5846 as "near" and "sp."); (I No. 2512 as "sp.).

Melba eggerti Reitter Edm., (as **Trimipsis**) "Beitrag zur Kenntniss der Clavigeriden, Pselaphiden und Scydmaeniden von Westindien". Deutsche Ent. Zeitschr., Vol. 27, No. 1, p. 38.
Berlin, 1883: TYPE from P. R.
Leng & Mutchler.

Melba parmata Reitter 83-40 (as **Trimipsis**): TYPE from P. R.
Leng & Mutchler.

Melba ventricola Reitter 83-39 (as **Trimipsis**): TYPE from P. R.
Leng & Mutchler.

PTILIDÆ

- Reichenbachia eucera** Aubé, Ch., "Revisión de la Famille des Psephaphiens". Ann. Soc. Ent. France, 2 Ser., Vol. 2, p. 120. Paris, 1844: TYPE from P. R.
Leng & Mutchler.

HISTERIDÆ

- Lioderma interrupta** Marseul
(as *L. ruptistria* Marseul) Gundlach.
Leng & Mutchler 17-203: recorded by Gundlach.
- Lioderma 4-dentatum** Fabricius—det. E. A. Schwarz.
under bark of decaying bucare tree, *Erythrina glauca*, at Cayey (254-17).
- Hister confinis** Erichson ?—det. H. S. Barber
(as sp.) Wetmore 16-100: eaten by Water-Thrush.
on dung at Yauco (I No. 5627 as "sp." 5770), at Coamo (I No. 5932 as "sp.").
- Omalodes krugii** Marseul
Gundlach.
Danforth: at Maricao iii-28 det. Mutchler, many specimens in decaying bananas; Mt. Montoso ix-22, Utuado viii-30, Mayagüez x-30.
- Omalodes ruficlavis** Sharp—det. E. A. Schwarz
under bark of decaying bucare tree, *Erythrina glauca*, at Cayey (246-17, 358-22); resting on grapefruit leaf at Manatí (155-15); in coffee grove at Villalba (L. A. Costas).
- Epierus antillarum** Marseul S. A. de, "Essai Monographique sur la Famille des Histerides". Ann. Soc. Ent. France, Ser. 3, Vol. 2, pp. 671-707. Paris, 1854: TYPE from P. R., Cuba and R. D.
Lewis, G., "Biol. Cent. Amer.—Coleoptera". Vol. 2, No. 7, p. 208. London, 1888: listed from P. R.
Leng & Mutchler.
- Epierus waterhousei** Marseul
Leng & Mutchler 17-203.
- Atholus confinis** Erichson
Leng & Mutchler 17-203.
- Carnicops dominicana** Marseul?—det. A. J. Mutchler
IPSup-39: under bark of *Erythrina* at Cayey (248-17).

Carnicops troglodytes Paykull
Gundlach.

Acritus analis Leconte

Gundlach, "muy pequeña (no pasa de 1 mm. en longitud)." in cow dung at Guánica (544-13 det. E. A. Schwarz).

LYCIDÆ

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LITERATURE

- Leng, C. W. & Mutchler, A. J.,** "The Lycidae, Lampyridae and Cantharidae (Telephoridae) of the West Indies". Bulletin American Museum of Natural History, Vol. 46, Art. 8, pp. 413-499, fig. 65. New York, August 24, 1922.
- Mutchler, A. J.,** "Notes on West Indian Lycidae and Lampyridae (Coleoptera), with Descriptions of New Forms." American Museum Novitates No. 60, pp. 1-13, fig. 1. New York, March 15, 1923.
- Mutchler, A. J.,** "Notes on West Indian Lampyridae and Cantharidae (Coleoptera) with Descriptions of New Forms." American Museum Novitates No. 63, pp. 1-9, fig. 1. New York, March 29, 1923.

Specimens of Lampyridae and Cantharidae determined by Messrs. Leng & Mutchler are noted by "det. L. & M." placed after the accession number or the initials of the collector.

Thonalmus dominicensis Chevrolat

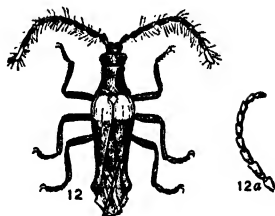
Danforth: two specimens very similar to if not this sp., coll. by F. Mora at Hormigueros viii-1-32.

Thonalmus chevrolati Bourgeois

(as *Calopteron suave* J. Duval) Stahl.

(as *Calopteron bicolor* Linn.) Van Z. (P. R. 807).

Leng & Mutchler 22-422: "in Porto Rico, by commercial introduction only, . . . at Guánica, April in boat-load of cane from Higueral, (R. H. Zwaluwenburg)."



Leptoclytus heterocornis Leng
& Mutchler, male. Eight
times natural size. 12 *a*
antenna of female. (After
Leng & Mutchler.)

Leptolycus heterocornis Leng & Mutchler 22-430 and 431, fig. 12,
TYPE from Porto Rico: swept from vegetation at Aibonito
and Cayey.
at Villalba (I No. 4845).

Leptolycus heterocornis var. *flavicollis* Leng & Mutchler 22-431.
TYPE of variety from Aibonito, Porto Rico.

LAMPYRIDÆ

Lucidiota decorus Gemminger & Harold

(as *Photinus decorus* E. Olivier) Leng & Mutchler 14-432.

Leng & Mutchler 22-536: redescribed, from Naguabo, Coamo
Springs, Corozal Cave and Bayamón.

Wolcott 24-14, 30: eaten by *Anolis evermanni* and *A. cristatellus*.
on coffee leaves (84-21), at Jájome Alto (289-23), on grape-
fruit leaves at Vega Alta (104-17 det. L. & M.); on El Duque
at Naguabo (725-14); on leaves of *Solanum torvum* at Ba-
rranquitas (404-22); on potato at Cidra (I No. 644); on
pomarrosa at Cidra (I No. 2715).

Lucidiota marginipennis Leng & Mutchler 22-438, TYPE from Ai-
bonito, Porto Rico.

Callophisma boreconea Leng & Mutchler 22-440 and 441, figs 17 &
17a, TYPE from Porto Rico: at Mayagüez, Adjuntas and
Martín Peña.

(as *Lychnuris dimidiatipennis* J. Duval) Stahl.

(as *Callophisma dimidiatipennis*) Olivier, E., "Contribution a la
Faune Entomologique des Antilles Lampyrides". Rev. Sci.
du Bourbonnais et du centre de la France, Vol. 25, p. 19. 1912:
listed from P. R.

Leng & Mutchler 23 (No. 60)-9: from Vega Alta and Lares.

Wolcott 24-14, 30: eaten by *Anolis evermanni* and *A. cristatellus*.
(I No. 5052), at Cidra (I No. 3580); on grapefruit foliage
at Vega Alta (103-17 det. L. & M.); on coffee leaves at Lares

(131-21 det. L. & M.), at Yauco (108-23, 198-23); on *Inga vera* at Mayagüez (258-23); on pomarrosa leaf at Bayamón (I No. 2063 Leonard 33-134, I No. 5315).



Callopisma boreoconia L. & M. (After Leng & Mutchler.)



Callopisma emarginata L. & M. (After Leng & Mutchler.)

Callopisma emarginata Leng & Mutchler 22-443, figs. 22 & 22a: TYPE from P. R., at Mayagüez, Adjuntas, Río Blanco Valley and Utuado.

Danforth: at Ponce xi-28, Maricao xii-30, Utuado x-30, Mayagüez iv-31, xi-31, v-31, Río Piedras i-32, Aguas Buenas xii-32.

AMC: also at Aguadilla xii-32.

resting on grapefruit at Vega Alta (I No. 525), at Consumo (I No. 4161); on orange at Peñuelas (I No. 1954, 1961 Leonard 33-132).

Pyraetomena galeata Olivier E., (as *Lecontea*) Bull. Soc. Zool. France, Vol. 24, p. 91, 1899, TYPE from Porto Rico and St. Thomas.

(as *Lecontea*) Leng & Mutchler 14-432.

Leng & Mutchler 22-453: at Fajardo, Arroyo, Aibonito, Manatí, Arecibo, Aguadilla and Santa Rita, and from Vieques Island.

Mutchler 23 (No. 60) -13: from La Plata.

Danforth: at La Tortuguera iii-27, Vega Alta x-29, Ponce, xii-32, Luquillo vii-32, Mayagüez v-26, etc.

AMC: at Utuado vii-30, Aguada xii-32, Algarrobo x-20, Yauco iii-30, etc.

at La Plata (GBM det. L. & M.); at Barceloneta (218-16); resting in cotton boll at Pt. Cangrejos (394-22); at Bayamón (I No. 3097, 3170).

Photinus sp. near *pantoni* E. Oliver—det. H. S. Barber at Bayamón (I No. 2871).

Photinus heterodoxus Leng & Mutchler 22-457 and 459, fig. 29, TYPE from Porto Rico: at Adjuntas and Fajardo.

Mutchler 23 (No. 63) -1: notes.

(unlabeled specimens—det. L. & M.).

Photinus dubiosus Leng & Mutchler 22-461, fig. 30, TYPE from Porto Rico: at Adjuntas, Mayagüez, Añasco, Maricao, Arecibo, Manatí, Aibonito, Caguas and Arroyo.

Mutchler 23 (No. 63) -2: from Lares and Río Piedras.

(as *P. glaucus*) Wetmore 16-106, 114, 116: eaten by Yellow Warbler, Yellow-Shouldered Blackbird and Oriole.

Wolcott 24-14, 23: eaten by *Anolis evermanni* and *A. krugii*.

Danforth: at Mayagüez v-26, Adjuntas iv-27, Rincón x-27, Maricao x-28, Ponce xii-32, Barranquitas xii-30, etc.

AMC: many records, Faro de Cabo Rojo iii-29, others in the mountains.

at light at Guánica (187-15) and on weeds (386-21); on coffee leaves (85-21 det. L. & M.), at Lares (107-22 det. L. & M.), at Ciales (57-21), in mountains north of Yauco (307-21), at San Sebastián (100-21); on *Solanum torvum* at Barranquitas (405-22); at Aibonito (SSC); on cotton at Boquerón (34-23); on orange at Adjuntas (I No. 1958), at Barranquitas (I No. 5924); in orange grove at Consumo (I No. 1467), at Mayagüez (259-23); at light at Bayamón (I No. 2871-B & C, 3341).



Photinus triangularis

E. Olivier. (After

Leng & Mutchler.)

Photinus triangularis E. Olivier, Ann. Soc. Ent. Belgique. Vol. 56, p. 25, 1912; Rev. Sci. du Bourbonnais, Vol. 25, p. 33, TYPE from El Yunque, Porto Rico.

Leng & Mutchler 14-432.

Leng & Mutchler 22-462, fig. 31: from Culebra Island.

Danforth: ? at El Yunque ii-27.

Photinus vittatus G. A. Olivier, "Entomologie" II, No. 28, p. 23, pl. 3, fig. 20, 1790, TYPE from Porto Rico and Santo Domingo.

Wetmore 16-87, 106, 108: eaten by Cliff Swallow and Warblers. (as sp.) Wetmore 16-80, 96, 108: eaten by Petchary, Vireo and Parula Warbler.

Leng & Mutchler 22-478: short description, from many localities.

Mutchler 23 (No. 63) -7: from Guánica, Toa Alta and La Plata.

Wolcott 24-30: eaten by *Anolis cristatellus*.

Danforth: at Cabo Rojo xi-27, many records at Mayagüez, Aguadilla xii-32, Manatí iv-29, Ciales i-32, Coamo Springs ix-29, Juncos xii-32, etc.

AMC: many records, Lajas xii-32, Yabucoa vi-30, etc.

at light at Bayamón (I No. 3169), at Guánica (578-13), at La Plata (GBM—det. L. & M.); on sugar-cane at Guánica (GNW), at Toa Alta (GNW—det. L. & M.); on coffee at Añasco (1371-12); on grapefruit at Arecibo (I No. 5041), at Vega Baja (513-16), at Naguabo (I No. 554); on tomato at Barceloneta (I No. 290); on potato leaf at Cidra (I No. 5017); on cucumber leaf (I No. 4890); on eggplant at Juncos (I No. 1780); on papaya at Arecibo (I No. 4677); on pepper at Bayamón (I No. 590).

CANTHARIDÆ (TELEPHORIDÆ)

Tytthonyx spp.—det. H. S. Barber

on pomarrosa at Villalba (I No. 4787); on chinaberry at Villalba (I No. 5665, 5687); on orange at Adjuntas (I No. 4303); on *Inga vera* at Aibonito (I No. 4358).

Tytthonyx cavicornis Leng & Mutchler 22-489, fig. 55: TYPE from Mona Island.



Tytthonyx cavicornis
L. & M. (After
Leng & Mutchler.)



Tytthonyx discolor L.
& M. (After Leng
& Mutchler.)

Tytthonyx discolor Leng & Mutchler 22-490, figs. 54 & 54a: TYPE from Aibonito, P. R., also from Desecheo Island.

Mutchler 23 (No. 63) -9: from Lares.

(one specimen from Lares or Camuy, det. L. & M.), (I No. 2125-B).

Tylocerus barberi Leng & Mutchler 22-497, fig. 65, TYPE from Manatí, Porto Rico: from many localities, "most of the specimens collected at light".

Danforth: at Manatí iv-29, Coamo Springs xi-30, at Mayagüez iii-27 and many others.

AMC: twenty-three records.

on *Inga vera* at Aibonito (I No. 4362); on corn (535-12 paraTYPE); at light at Guánica (578-13 paraTYPE), at La Plata (GBM, July 11, 1915); at Cayey (27-21); on water-sprout of undetermined tree in large numbers, at Barceloneta (217-16); resting on grapefruit foliage at Vega Baja (514-16); at Palo Seco (2133), at Pueblo Viejo (I No. 2806); on almendra at Arecibo (I No. 3002); at Villalba (I No. 5173); at light at Bayamón (I No. 3129, 3168, 4209), at Mayagüez (I No. 2320).

MELYRIDÆ

Alymeris sp.—det. G. E. Bryant

on cotton boll at Pt. Cangrejos (399-22); on *Inga laurina* flowers at Adjuntas (I No. 3884); at Ponce (I No. 5493 as "near" det. H. S. Barber).

Attalus spp. or **Amphicomus** spp.—det. H. S. Barber

on flowers of *Inga laurina* at Yauco (I No. 3870, 3894); on banana leaves at Ponce (I No. 3876).

CLERIDÆ

Epiphloeus sp.—det. E. A. Chapin

on flowers at Ponce (I No. 4969).

Opilo unifasciatus Erichson

Gundlach, determined by M. Chevrolat.

Callotillus crusee Wolcott, A. B., "Two New Species of West Indian Cleridae". American Museum Novitates, No. 59, pp. 13, fig. 1. New York, Feb. 14, 1923; TYPE from Camuy, P. R. on ground at Camuy (204-22 TYPE).

CORYNETIDÆ

Phyllobaenus sp.—det. E. A. Chapin

at Guánica (I No. 5853).

Necrobia rufipes DeGeer—det. Sanford

on cucumber at Loíza (I No. 1897).

OEDEMERIDÆ

Copidita lateralis Waterhouse?—det. H. S. Barber

(I No. 2223, 3841, 5040), at Bayamón (I No. 5035 as "sp.").

Oxacis geniculata Chevrolat 77-X: TYPE from P. R.

Stahl. Gundlach. Leng & Mutchler. Wolcott 26-50: resting on sea-grape.

"This has been called *geniculata* Chev. but can not be that species and no description fitting it has yet been found." H. S. Barber.

On the assumption that Mr. Barber's statement is correct, the name *litoris* is proposed by the compiler for specimens collected on the beach of the north coast of Puerto Rico to which the following description will apply:

Elongate, slender. Dully shining, dark iridescent green, elytra dark iridescent purple, entire insect (except dull black eyes) finely punctate and covered with minute, short, silky white hairs. First joint of antenna longest, twice as broad at apex as at base, second joint shortest, third joint not quite as large as first, less dilated towards apex, others slightly shorter and progressively less dilated towards apex, terminal segment broadest at middle, rounded at tip. Head much longer than broad, but nearly half of its length may be retracted within the prothorax, covering it up to the eyes. Clypeus often dull yellowish at apex. Prothorax longer than broad, broadest towards apex, base and apex of approximately equal width, posterior margin upturned. Elytra faintly striate, humerus prominent, behind which elytra appear from above somewhat narrowed. Length 5-7 mm.

common on the beach in the spring, at Loíza Aldea (130-16), at Arecibo (164-23), attracted by fire, and on the leaves of *Coccoloba uvifera* (257-16), at Dorado (I No. 4180 as "sp."); attracted to light in Condado (130a-16), at San Juan in May (I No. 4112), at Plantaje and Palo Seco (229-16), at Dorado in May (28-33); on flowers of *Metastelma* (160-23, 229-23); (also I No. 2327-B, 4186 Leonard 33-118, det. H. S. Barber as "*Oxacis* sp." and "near *lateralis* Wat."); at Pt. Cangrejos, April 23, 1920 (GNW); reported by F. Seín on Mona Id. in October (58-25 no specimens).

Oxacis sp.—det. A. J. Mutchler

Danforth: at Mayagüez iii-27.

Ditylus sp. nov.—det. A. J. Mutchler

Danforth: many specimens from Desecheo Id., v-8-27.

Ananca vittata F.

Chevrolat 77-X. Gundlach. Leng & Mutchler.

Leng & Mutchler 17-215: from Vieques Island.

Wolcott 26-50: resting on sea-grape.

Danforth: at Faro de Cabo Rojo v-27 det. Mutchler, Mayagüez ii-27, Vieques Id. i-29, etc.

AMC: many records at Mayagüez and Cabo Rojo, at Humacao xi-30, Yauco xii-32, Añasco x-30.

a larger, yellowish-brown species, eyes black, elytra, except for margins, light brown; common at light near beach (277-12), at Santurce (141-22), at Pt. Cangrejos (January to March, 1920 GNW, December and January 7-33), at Aguirre in May (160-16) tremendously abundant and troublesome, even getting into tightly screened houses, in June (232-23), at Guánica in July and August (568-13); at Isabela, one specimen at light in May (118-31).

MORDELLIDÆ

Mordella basifulva Quedenfeldt, G., 86-125: TYPE from P. R. Gundlach. Leng & Mutchler.

(as sp.) on *Casearia* flowers at Trujillo Alto (887-13 det. E. A. Schwarz).

Mordella leucocephala Quedenfeldt, G., 86-124: TYPE from P. R. Gundlach. Leng & Mutchler.

on *Ficus* at Ponce (I No. 4619 ?), on coffee (I No. 3477 ?).

Mordella scutellaris Fabricius

Quedenfeldt. Gundlach. Leng & Mutchler.

on *Bidens pilosa*, cundeamor and other flowers at Arecibo (I No. 5268, 3095-B, 3828); on *Senegalia* flowers at Ponce (I No. 4485); on milkweed flowers at Bayamón (I No. 5542).

Mordella sp.—det. H. S. Barber.

on coffee at Mayagüez (I No. 4565); on *Ficus* at Ponce (I No. 4619).

Mordellistena signaticollis Quedenfeldt, G., (as *Mordella*) 86-125: TYPE from P. R.

(as *Mordella*) Gundlach.

Leng & Mutchler.

(as sp.) Wetmore 16-84: eaten by Wood Pewee.

Mordellistena annuliventris Quedenfeldt, G., 86-126: TYPE from P. R.

Gundlach. Leng & Mutchler.

(as sp.) Wetmore 16-99, 106: eaten by Redstart and Yellow Warbler.

Mordellistena ferruginea Fabricius

Quedenfeldt. Gundlach. Leng & Mutchler.

on banana leaf at Ponce (I No. 4334); on mamey leaf at Barceloneta (I No. 4019); on *Inga laurina* at Juana Díaz (I No. 4052).

Mordellistena sp.—det. H. S. Barber

on orange at Adjuntas (I No. 3895); on moca at Ponce (I No. 4125); on pomarrosa at Ponce (I No. 4616), at Aibonito (I No. 5629); on grapefruit at Bayamón (I No. 5419); (I No. 4053).

Pentaria sp.—det. H. S. Barber
on *Randia mitis* at Ponce (I No. 4495).

RHIPHOPHORIDÆ

Macrosiagon basalis Gerstaecker
(as *Rhipiphorus*) Quedenfeldt 86–128. Gundlach.
Leng & Mutchler.

Macrosiagon discicolle mutilatus Gerstaecker
(as *Rhipiphorus*) Quedenfeldt 86–128. Gundlach.
Leng & Mutchler.
Danforth: at Río Piedras xii–30 det. Mutchler.

Macrosiagon discicolle melanoptera Chevrolat, A., (as *Emenadia*)
77–IX: TYPE from P. R.
Gundlach, “M. Chevrolat nombre una variedad *Emenadia melanoptera* en 1887 en la Rev. Zool”.
Leng & Mutchler.
Danforth: at Río Piedras xii–30 det. Mutchler as “var. ?”.
swept from weeds (17–13, 389–12 det. H. S. Barber).

Macrosiagon discicolle quadrimaculatus Gerstaecker
(as *Rhipiphorus*) Quedenfeldt 86–128. Gundlach.
Leng & Mutchler.
on seeds pods of Jamaican sorrel at Bayamón (I No. 3327);
on palm leaf at Trujillo Alto (I No. 4918 as var. ?); at Bayamón (I No. 5301).

Macrosiagon sp.—det. H. S. Barber
on icaco at Mayagüez (I No. 5389).

Rhipiphorus sordidum Gerstaecker, var. **major** Quedenfeldt, G., 86–128: TYPE of variety from P. R.
Gundlach. Leng & Mutchler.
(as sp.) Wetmore 16–89: eaten by Martin.

MELOIDÆ

Epicauta annulicornis Chevrolat, A., 77–IX: TYPE from P. R.
Gundlach. (as *Macrobasis*) Van Z. (P.R. 803).
(as *Zonitis*) Danforth: at Mayagüez ii–27 det. Mutchler, iii–27.
(as *Cantharsis*) Leng & Mutchler.
AMC: three records from Mayagüez.

Epicauta obscuricornis Chevrolat, A., 77–IX: TYPE from P. R.
Gundlach.
(as *Cantharsis*) Leng & Mutchler.

Zonitis sp.—det. E. A. Schwarz
Mostly dull yellow in color, median area of disc of prothorax and two large longitudinal bands on each elytra brown; length 11 mm.
at light at Guánica (590–13).

Zonitis sp.—det. E. A. Schwarz

15–16 mm. long: areas of brown at base and near apex of elytra.

at light at Guánica (613–13).

Horia auriculata Duges—det. E. A. Schwarz

(as sp.) Danforth: at Hormigueros v-33, Río Piedras ix-31, (a single unlabeled female); (15–34).

Tetraonyx quadrimaculatus Fabricius

Chevrolat 77–X. Stahl. Gundlach. Leng & Mutchler.

Danforth (& AMC): at Villalba x-30 det. Mutchler, Jayuya xii-32.

(209–13 det. Schwarz); on flowers of *Aeschynomene americana* at Arecibo (3–17); abundant, injuring grapefruit blossoms at Bayamón (I No. 5344); on flower of wild blue pea at Bayamón (86–33); on Lantana flower at Trujillo Alto (I No. 4176); eating flowers of "tecoma" vine at Isabela, June, 1935, F. Scín.

ANTHICIDÆ

Anthicus floralis Paykull

Stahl. Quedenfeldt. Gundlach. Leng & Mutchler.

Wetmore 16–114: eaten by Yellow-Shouldered Blackbird.

abundant in central whorl of young shoots of sugar cane at Arecibo (636–21); at light at Ponce (I No. 4048).

Anthicus vicinus LeFerté-Sénéctère, M. F. T. de, "Monographie de *Anthicus* et gen. voisins". p. 157. Paris, 1848: TYPE, given as "*America borealis*", actually from P. R.

(and as *A. fulvomicans* Quedenfeldt, G. 86–122, TYPE from Portorico) Gundlach. Leng & Mutchler.

Merrill 15–54: in fresh cow dung.

in cow dung at Guánica (GBM—det. E. A. Schwarz), and probably this species: ferruginous, shining, not pubescent, legs lighter in color, elytra densely punctate, dark at apex and about the middle, under old cow manure at Guánica (543–13).

Anthicus sp. poss. **fulvipes** La Ferté—det. E. A. Schwarz

among aphids under okra leaves (733–13); on flamboyant flowers at Juana Díaz (I No. 4367).

Notoxus bipunctatus Chevrolat, A., Ann. Soc. Ent. France (5), VII, Bulletin p. ix, 1877: TYPE from P. R.

Leng & Mutchler.

at light at Pt. Cangrejos (GNW, Dec. 1919,—Feb. 1920, det. E. A. Schwarz); on "húcar" at Ponce (I No. 4511).

Notoxus dentipennis Chevrolat, A., Bull. Soc. Ent. France, (5), VII, Bulletin p. ix, December, 1877: TYPE from P. R.

(as *N. krugii* Quedenfeldt, G. 86-121: TYPE from Portorico, which, according to H. S. Barber, is a synonym for *N. bipunctatus*.)

Gundlach.

Amblyderus sp.—det. H. S. Barber

on *Randia milis* and other flowers at Ponce (I No. 4473, 4515).

EUGLENIDÆ

All the determinations in this family were made by Mr. H. S. Barber.

Xylophilus (Zonantes?) sp.

on orange at Ponce (I No. 3435), at Juana Díaz (I No. 3719); on coffee at Ponce (I No. 3478); on tomato at Ponce (I No. 3398).

Xylophilus (Pseudariotus) sp.

on coffee at Ponce (I No. 3806, 3395); on *Adenanthera pavonina* at Bayamón (I No. 4665).

(Xylophilus) Ganascus guttatus Champion ?

on coffee at Ponce (I No. 3190, 3200, 3430, 3431, 3724, 3769); on mocha at Ponce (I No. 4124); on *Guilandina crista* at Ponce (I No. 3077); on *Quercus thomsonii* at Ponce (I No. 3475); on orange at Juana Díaz (I No. 3718); on guava at Juana Díaz (I No. 2517); on "mabí" at Mayagüez (I No. 4730).

Xylophilus (Sandytes) near *ptinoides* Sz.

on orange at Ponce (I No. 3473, 3723); on coffee at Ponce (I No. 3430-B, 3431-B, 3432, 3720, 3767, 3802); on orange at Juana Díaz (I No. 3718).

Hylophilus sp.

on coffee at Adjuntas (I No. 2248).

ELATERIDÆ

Mr. R. H. Van Zwaluwenburg, at the time he was in the United States Bureau of Entomology, determined all the species of Elateridae in the original list.

Chalcolepidus silbermanni Chevrolat—det. W. S. Fisher

Danforth: at Mayagüez xi-34, Salinas xii-32 (Hipólito Monserrate).

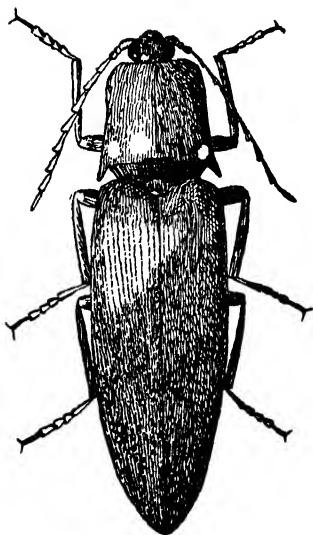
Pyrophorus luminous Illiger, J. C. W., "Monogr. d. Elateren (*Phyrophorus*)" Mag. Gesellschaft nat. Fr. 1, p. 149. Berlin, 1807: TYPE from P. R.

(as *Elater phosphoreus*) Ledru 1780.

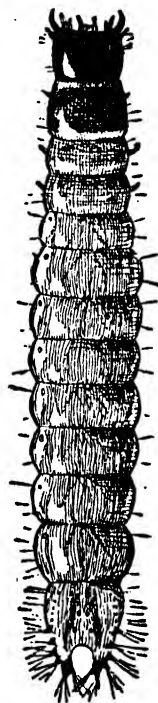
(as *P. pyralis* Germar or *P. phosphoreus* Fabr.) Stahl.

Gundlach. Leng & Mutchler. Van Z. (P. R. 23) adults in decaying fallen mangoes, larvae predatory on white grubs.

Wolcott, G. N., "El Cucubano, *Pyrophorus luminous* Ill." Circ. No. 80, Estación Experimental Insular. Río Piedras. P. R., pp. 5-8, figs. 3. San Juan, October 1923.



Pyrophorus luminous Illiger.
Twice natural size. (Drawn
by G. N. Wolcott.)



Pyrophorus luminous Illiger, larva.
Twice natural size.
(Drawn by G. N. Wolcott.)

Wolcott 24-53: one larvae ate 68 white grubs from egg stage to pupation.

Wolcott 24-6: value in destroying white grubs.

Wolcott 24-55: larvae entirely carnivorous.

EEP-26: larva a predator on white grubs.

Dexter 32-5: eaten by Surinam toad, *Bufo marinus*.

EEWI-463: attacking grubs of *L. citri* Smyth.

Tucker 34-19: adults sent from P. R. to Barbados by airplane express.

Wolcott 34-103: recommended to Mr. W. E. Jepson for control of *Phytalus smithi* in Mauritius.

Danforth: at Mayagüez in March, and later.

AMC: at Mayagüez, in February, April, May, June, July, November and December, at San Germán xii-33, Yauco xii-32, Ponce xii-32, xii-33, Coamo vi-30, Maricao vi-32, Jayuya v-30, Rincón xii-32, Florida vi-31, Añasco x-31, Carolina v-31, Luquillo vi-32,

reared from egg, adult in May (215-23); adults collected in February (71-23); in March at Hormigueros (THJ); in April (75-11, 253-12, 313-12, 392-13, 107-21, 27-33), at Pueblo Viejo (313-12), at Toa Baja (93-15); in May (I No. 2351), at Bayamón (I No. 4203), at Aibonito (No. 5626), at Ponce (I No. 4119), two thousand adults collected at Cidra to send to Barbados (32-33); in July at Aibonito (SSC); in July at Yauco (765-15); first pupa of the year at Cidra in January (1-35).

Monocrepidus bifoveatus Palisot de Beauvois

Wetmore 16-61, 96, 114, 119: eaten by Ani, Latimer's Vireo, Yellow-Shouldered Blackbird and Mozambique.

EEP-96 and Wolcott 24-55: not so common as a pest of tobacco as *Acolus elegans*.

Wolcott 24-96: larva injurious to tobacco.

Wolcott 24-1114: eaten by *Ameiva exsul* and *Anolis evermanni*.

Dexter 32-5: eaten by Surinam toad, *Bufo marinus*.

Danforth: at Coamo iii-29 det. Mutchler, Utuado viii-30, etc.

AMC: many records.

(I No. 890, 971) at light (140-April, 1922, 180-July, 1921), at Pt. Cangrejos (April and May, 1920, GNW), one adult at Guánica (705-June, 1914); on grapefruit foliage at Vega Baja (494-August, 1916), at Barceloneta (220-June, 1916); at Pt. Cangrejos on *Corchorus hirsutus* (81-June 1916), (242-June, 1932); in cotton squares at Isabela (167-June, 1921), at Hatillo (298-October, 1922); in empty cocoons of *Alabama argillacea* Hübner at Hatillo (202-August, 1922); in corn at Barceloneta (I No. 3291); on almendra at Barceloneta (I No. 2329 Leonard 33-132—as *Conoderus*).

Monocrepidus lividus DeGeer

(as sp.) Wetmore 16-84, 106: eaten by Wood Pewee and Yellow Warbler.

Danforth: at Jayuya vi-27 det. Mutchler.

at light at Pt. Cangrejos (January to May, 1920, GNW); at Hatillo in cocoons of *Alabama argillacea* Hübner (202-August, 1922); on casuarina (I No. 2975 ?).

Monocrepidus pinguis Candeze

at light (74-April, 1911), at Aibonito (June 1, 1913, SSC).

Monocrepidus memorabilis Candeze

at light at Guánica (506½-13).

Heteroderes amphicollis Gyllenhal (?)

in earth (243-12).

Heteroderes laurenti Guérin

Dexter 32-6: eaten by Surinam toad, *Bufo marinus*.

Aeolus binotatus Candeze (?)

under cane trash at Arecibo (189-11)

Aeolus elegans Fabricius

Gundlach.

(as *Drasterius* sp.) Wetmore 16-22: eaten by Cuban Green Heron.

Wolcott 24-55: the "tijerilla" of tobacco.

Wolcott 24-95: successful experiments in control with attraction to potato tubers in tobacco fields.

EEP-96 and EEWI-544: economic accounts.

Dexter 32-6: eaten by Surinam toad, *Bufo marinus*.

Danforth: at Coamo iii-29 det. Mutchler, La Plata iii-29 det. Mutchler, Fajardo xii-29, Cartagena Lagoon iii-31, etc.

on leaves of eggplant (735-13, 343-17); on leaves of *Rauwolfia nitida* at Yauco (316-21); on leaves of undetermined plant at Barceloneta (219-16); in excrement of *Laphygma frugiperda* S. & A., on corn at Aguadilla (27-22); in cotton squares at Garrochales (299-22, 243-23); on "húcar" at Ponce (I No. 4695).

Aeolus litoris sp. nov. described by G. N. Wolcott (IP-87); generic determination by Dr. E. A. Schwarz.

only 3 mm. long, elytra densely ciliate and punctate, lighter brown in color than the polished prothorax, with a small elongate dark brown area on the outer margin opposite a large, irregularly-semicircular, piceous spot about the middle of the inner margin, which is dark brown almost to apex.

in pile of coconut husks near beach at Arecibo (250-22 TYPE); in spider nest on leaves of *Dalbergia Ecastophyllum* at Pt. Cangrejos (GNW); on mangrove at Ponce (I No. 4689); on flowers of *Randia mitis* at Ponce (I No. 4493).

EUCNEMIDÆ

Fisher, W. S.,

"New Eucnemid Beetles from Puerto Rico."
Jour. Agr. Univ. P. R., Vol. 19, No. 2,
pp. 65-66. San Juan, October 15, 1935.

Dirhagus puertoricensis Fisher 35-65: TYPE from Ponce, P. R.
(as *Microrhagus* sp.) Wetmore 16-66: eaten by P. R. Tody,
Todus mericanus.

on coffee at Ponce (I No. 4315 TYPE).

Dirhagus oakleyi Fisher 35-65: TYPE from Aibonito, P. R., "differs from *D. puertoricensis* Fisher in having the elytra bi-colored, with a golden yellow pubescent fascia at apical third, and antennae flabellate."

on *Eugenia* sp. at Aibonito (I No. 5617 TYPE).

Nematodes puertoricensis Fisher 35-65: TYPE from Matrullas Dam, near Orocovis, P. R.

on weeds at Matrullas (I No. 5859 TYPE).

Adelothyreus insularis Fisher 35-65: TYPE from Aibonito, another Adjuntas, P. R., "a large brownish yellow spot covering the exterior three-fourths of each elytron".

on *Eugenia* sp. at Aibonito (I No. 5617 TYPE), on dead wood at Adjuntas (I No. 5206).

Arrhipis lanieri Guerin

Fletiaux, Ed., "Liste des Eucnemidae du Musée de Berlin et Description des Espèces Nouvelles." Ann. Soc. Ent. Belgique Vol. 41, p. 256. Brussels, 1897: listed from P. R.

Leng & Mutchler.

THROSCIDÆ (TRIXAGIDÆ)

Draptetes chalybaeus Gerstaecker, Carl, E. A., "Die Arten der Gattung *Lissomus* Dalm." Linn. Ent., Bol. 14, p. 169. 1860: TYPE from P. R.

Leng & Mutchler.

(as sp.) on *Mayepea* at Guánica (I No. 5855).

BUPRESTIDÆ

Fisher, W. S.,

"A Revision of the West Indian Coleoptera of the Family Buprestidae." No. 2522, Proc. U. S. Nat. Museum, Vol. 65, Art. 9, pp. 1-207. Washington, D. C., 1925.

Mr. W. S. Fisher has described the new species and made all recent determinations of Buprestidae from Puerto Rico.

Acmaeodera gundlachi Fisher 25-45: TYPE from Guánica, P. R., others from Añasco, Aibonito, Tallaboa, Martín Peña.

(as sp.) Wetmore 16-77, 80, 82, 96, 125: eaten by Kingbird, Petchary, Flycatcher, Latimer's Vireo and Grossbeak.

at Ponce (I No. 4471, 4615), on flowers of húcar at Ponce (I No. 4480); on sugar-cane at Guánica (175-22); on mangrove flowers at Martín Peña (523-17, 524-17).

Polycesta thomae Chevrolat

Danforth: on Vieques Id. ix-32 det. Fisher.

Chrysobothris dentipes Germar—det. W. S. Fisher

Danforth: at Mayagüez vi-32.

Chrysobothris megacephala Castelnau & Gory

Fisher 25-112 to 114: larvae in *Agati grandiflora* at Ensenada (Santa Rita), P. R., reared by E. G. Smyth.

Danforth: at Hormigueros viii-32 det. Fisher.
(176-22); in flight at Isabela (3-32 Leonard 33-134).

Chrysobothris tranquebarica Gmelin

(as *C. impresa* F.) Stahl. Gundlach.

(as *C. denticulata* Castelnau & Gory) Wetmore 16-80: eaten by Petchary, *Tolmarchus taylora*.

(as *C. fraterna*) Mannerheim, Graf Carl G. von, Bul. Soc. Imp. Nat. Moscou, Vol. 10, No. 8, pp. 75-76. 1837: TYPE from P. R. Van Z. (P. R. 1668) on *Eucalyptus* sp.

Danforth: at Maricao iii-29, Utuado viii-30, Yauco ii-31, Mayagüez v-32, etc.

AMC: at Añasco vi-32, Ponce ix-29, etc.

Fisher 25-96 to 99: synonymy, redescription, collections from Mayagüez and San Sebastián, P. R.

on stump at San Sebastián (97-21); larvae, presumably of this species, attacking casuarina trees at Vega Baja (GNW).

Chrysobothris thoracica F.—det. W. S. Fisher

Fisher 25-123 to 125: at Guánica (Santa Rita), P. R.

in flowers of ? at Ponce (I No. 4691); on dead branch at Guánica (I No. 5928).

Chrysobothris wolcottii Fisher 25-119 to 121: TYPE from Mayagüez, others from Río Piedras and Añasco, P. R., synonymy with *lepida*.

(as *C. lepida*) Gundlach.

Danforth 26-104: eaten by P. R. Grackle.

Danforth: 31-81: eaten by P. R. Flycatcher.

Danforth: at Cartagena Lagoon iii-30 in stomach of *Myiarchus antillarum*, at Maricao i-31, etc.

AMC: seven records from Mayagüez.

(798-12), at Ponce (I No. 4470).

Buprestis lineata F.

(as *Ancylochira*) Stahl. Gundlach.

Fisher 25-152: quoting Stahl and Gundlach.

Danforth: at Mayagüez iv-33 det. Fisher.

Buprestis decora Olivier

(as *Ancylochira*) Gundlach.

Fisher 25-148: quoting Gundlach.

- Neotrachys hoffmani** Fisher, W. S., "New West Indian Buprestidae (Coleoptera)." Proc. Ent. Soc. Washington, Vol. 32, No. 7, pp. 125-129. Washington, D. C., October 1930: TYPE from P. R., "allied to *guadeloupensis* --, but differs in being subopaque, uniformly dark bronzy green above, broadly elongate, and not so strongly narrowed posteriorly".
on *Areca Catechu* at Adjuntas (I No. 4791).

- Taphrocercus elegans** Fisher 25-187 to 188: TYPE from El Yunque, P. R.
from El Yunque (329-17 TYPE); on chinaberry at Adjuntas (I No. 4782).

- Micrasta oakleyi** Fisher, W. S., "Two New Buprestid Beetles from Puerto Rico". Proc. Ent. Soc. Washington, Vol. 37, No. 2, pp. 30-32. Washington, D. C., February 1935: TYPE from Ponce, P. R., "smaller (than *cubensis*), glabrous, and uniformly brownish cupreous,---the marginal carina on each side of the pronotum entire".
on *Trophis racemosa* at Ponce (I No. 4487 TYPE).

- Micrasta ornata** Fisher 35-31: TYPE from Guánica, P. R., "elytra ornamented with violaceous black spots, the marginal carina on each side of the pronotum obliterated anteriorly, and the elytra deeply depressed along the base".
at Borinquen Forest Reserve, Guánica (I No. 5856 TYPE).

ELMIDÆ

- Cylloepus danforthi** Musgrave, P. N., "Two New Elmidae from Puerto Rico, with Description of New Genus (Coleoptera)." Proc. Ent. Soc. Washington, Vol. 37, No. 2, pp. 32-35, fig. 1. Washington, D. C., February 1935: TYPE from Río Cañas, Las Marías, P. R.

- Neelmis gracilis** Musgrave 35-35: TYPE from Río Cañas, Las Marías, P. R.

- Elmis filiformis** var. ?—det. H. S. Barber
coll. W. A. Hoffman.

HELODIDÆ

- Scirtes** sp.—det. Guy A. K. Marshall
in cotton squares at Algarrobo (198-22); on flowers of "húcar" at Ponce (I No. 4529); on flowers of *Dioscorea* at Juana Díaz (I No. 4543, 3474); on moca at Juana Díaz (I No. 4681); on mangrove at Fortuna, Ponce (I No. 5630); on guava at Aibonito (I No. 5633 ?); on orange at Ponce (I No. 4126); on cacao at Ponce (I No. 4047 ?).

Prionoscirtes dilaticornis Champion—det. H. S. Barber
on orange at Ponce and Villalba (I No. 3474-B).

Ptilodactyla sp. "perhaps **emarginata** Chevrolat ?"—det. H. S. Barber.

on *Eugenia* sp. at Villalba (I No. 4785); on betel palm at Adjuntas (I No. 4786); on ? at Ponce (I No. 4847-B); on ? at Yauco (I No. 5507).

CHELONARIIDÆ

Chelonarium punctatum F.

Stahl. Gundlach.

Danforth (& AMC): at Coamo Springs xi-30 det. Mutchler, Añaseo x-30, Villalba vi-30, Mayagüez many records.

resting on leaf of "cereza", *Malpighia puniceifolia*, at Ponce (I No. 2375); of mulberry (154-23), of *Inga vera* at Ciales (219-22); elytra in bird dung at Camuy (GNW); larvae in rotten stump at Lares, reared to adult (164-21 det. E. A. Schwarz); adults in banana traps for *Cosmopolites sordidus* (304-23); on *Scirpus validus* at Ponce (I No. 4697); at Mayagüez (I No. 4547).

DERMESTIDÆ

Dermestes vulpinus F.

Stahl. Gundlach.

(I No. 5372), on dock at San Juan (I No. 3761).

Dermestes cadaverinus F.—det. E. A. Schwarz

Danforth: at Mayagüez xi-28 det. Mutchler, Yauco xii-32, San Germán xii-32.

AMC: at Río Piedras ix-31 and several records from Mayagüez. on sausage at Mayagüez (90-24).

Dermestes carnivorus F.

Stahl. Gundlach.

Grytorhopalum sp.

Wetmore 16-104, 105, 108: eaten by Warblers.

Danforth: at Algarroba iv-30 det. Mutchler as "sp. nov."

on flowers of *Inga laurina* at Adjuntas (I No. 3872, 3880, 3885, 3886); on jasmine flowers at Bayamón (I No. 3326); on guácima flowers at Aibonito (I No. 5620); on flowers of "capa" *Cerdana alliodora*, and "junco" *Scirpus validus* at Ponce (I No. 4527, 3422, 4967, 4477—the latter collection representing three sp. det. H. S. Barber).

Trogoderma insulare Chevrolat

Stahl. Gundlach.

on tomato at Loíza (I No. 3439 as "sp."); at Bayamón (I No. 5809—det. as "sp." H. S. Barber).

Globicornis fulvipes Guérin

(as *Trogoderma*) Stahl. Gundlach.

(I No. 1846, 1913, 2027, 2125, 4401).

Attagenus piceus Olivier—det. E. A. Schwarz

on cotton at Quebradillas (307-22).

Attagenus sp.—det. H. S. Barber

(I No. 2990, 3362, 3683, 3945, 4190, 4321).

BYRRHIDÆ

Eulimnichus sp.—det. H. S. Barber

at light at Mayagüez (I No. 2422).

Limnichoderus sp.—det. as “near *navicularis* Casey” H. S. Barber

in water at Ponce (I No. 5739).

† **Lioon** sp.—det. H. S. Barber

on betel palm at Adjuntas (I No. 4789).

RHYSODIDÆ

Clinidium sp.—det. W. S. Fisher

in decaying wood at Adjuntas (I No. 5196-B, 5196).

OSTOMIDÆ (TEMNOCHILIDÆ TROGOSITIDÆ)

Airora sp.—det. W. S. Fisher

under dead bark at Guánica (I No. 5868).

Temnochila aenea Olivier

Leng & Mutchler.

Temnochila portoricensis Leveille, A., Ann. Soc. Ent. France, Vol.

76, p. 401, 1907: TYPE from P. R.

Leng & Mutchler.

(as sp.) Wetmore 16-63: eaten by Woodpecker.

Tenebroides punctulata Chevrolat

(as *Trogosita*) Stahl.

Reitter, Edm., “Die Sud- und Mittel-Amerikanischen Arten der Gattung *Tenebroides* Bill. et. Mitterp”. Verh. Nat. Ver.

Brünn für 1874, Vol. 13, p. 74. 1875: listed from P. R.

(as sp.) Wetmore 16-63, 66: eaten by Woodpecker and Tody.

Leng & Mutchler.

Tenebroides transversicollis Jacq. Duval

(as *Trogosita*) Gundlach.

Tenebroides mauritanicus Linn.—det. R. T. Cotton

Danforth: at Mayagüez ix-30, and many other records.

reared from rice (314-22).

NITIDULIDÆ

Colopterus amputatus Erichson

Leng & Mutchler.

Danforth: at Mayagüez det. Mutchler.

Colopterus truncatus Randall

Leng & Mutchler.

(as *Colastus infimus*) Erichson, G. F., in Germar, E. F., "Versuch einer Systematischen Eintheilung der Nitidularien". Zeit. für die Ent., Vol. 14, p. 245. 1843: TYPE from P. R.

(as *Colastus*) Sharp, David, "Biología Centrali Americana—Coleoptera. Nitidulidae". Vol. 1, No. 2, p. 304. 1890: listed from P. R.

Conotelus fuscipennis Erichson

Stahl. Gundlach, "se le encuentra a menudo en el cáliz de las flores".

(as *C. conicus* Fabr.) Leng & Mutchler 17-203.

in flowers of *Partium tiliaceum* at Ciales (280-22 det. E. A. Schwarz); in flowers of *Tecoma pentaphylla* (266-12); in flowers of rose at Adjuntas (I No. 2518, 4000 Leonard 33-125); on kumquat at Arecibo (I No. 4941 det. as *C. canicus* F.); in flowers at Bayamón (I No. 5263 det. as "sp.").

Carpophilus dimidiatus Fabricius

Van Z. (P. R. 1514) in corn meal.

in flour (290-17—det. doubtful).

Carpophilus dimidiatus, var **mutilatus** Erichson

Leng & Mutchler 17-203: from Vieques Island.

Carpophilus hemipterus Linn.—det. E. A. Schwarz

Wetmore 16-89: eaten by Martin.

on decaying cane seed (349-12); in maga pods from Vega Alta (I No. 5254-B det. as "sp.")

Carpophilus tempestivus Erichson—det. W. S. Fisher

in oranges at Ponce (I No. 816).

Haptoncus luteolus Erichson

(as *Epurma*) Gundlach.

Wetmore 16-74: eaten by Flycatcher, *Anthracothonax aurentus*.

under leaf-sheaths of sugar cane (202-11 det. E. A. Schwarz). very abundant on cane chewed by rats (726-13 det. E. A. Schwarz); on tassels of corn growing in cane field at Trujillo Alto (724-12 det. Schwarz); at Bayamón (I No. 2879, 3362); in crated oranges at Ponce (I No. 725); in rotten grapefruit at Vega Baja (I No. 1211); in rotten jobo fruit (I No. 1014, 2888); in jobo de India fruit at Arecibo (I No. 1628 Leonard 33-117); in rotten nispero (I No. 824); in rotten pods of *Inga laurina* (I No. 1259 Leonard 32-143); in rotten star-apple at Arecibo (I No. 2325 Leonard 33-134).

Urophorus humeralis F.—det. E. A. Chapin

under almendra fruits on ground at Arecibo (I No. 1598, 1630 Leonard 33-129); on jobo de India fruit at Arecibo (I No. 1627 Leonard 33-119).

Stelidota geminata Say

Gundlach.

(as sp.) Wetmore 16-75, 87: eaten by Swift and Cliff Swallow. Danforth (& AMC): at Maricao in decaying citrus fruits iv-31 det. Mutchler, Las Marías x-31, Mayagüez many records. from ectocarp of almendra fruits at Añasco (I No. 1587 Leonard 33-129); in orange at Barceloneta (I No. 1241 Leonard 32-143); at Juana Díaz (I No. 3803), at Ponce (I No. 4960); in rotten grapefruit at Vega Baja (I No. 1211); from jobo fruit (I No. 998); at light at Bayamón (I No. 3362, 5721).

Stelidota ruderata Erichson

Gundlach.

Danforth: at Maricao iv-31 det. Mutchler, also many other places and dates, common in rotting citrus fruits.

AMC: at Las Marías x-31, Mayagüez and Maricao, many dates.

Lobiopa insularis Castelnau

(as *L. decumana* Erichson) Stahl. Gundlach.

Leng & Mutchler 17-203: quoting Stahl and Gundlach.

(as *L. decumana* Erichson) Danforth (& AMC): at Mayagüez xi-30 det. Mutchler. Maricao iv-31, etc., common in rotten grapefruit.

all stages in fruit of guava on the ground (224-16 det. E. A. Schwarz *L. decumana*); in jobo fruit (I No. 1327 Leonard 32-144); in orange fruit at Yauco (I No. 1038); under bark of tree at Arecibo (I No. 1782 Leonard 33-134); (I No. 925, 1327), at Bayamón (I No. 1038).

Glischrochilus sp.—det. A. G. Böving

in orange fruit at Ponce (I No. 4129).

MONOTOMIDÆ

Europs apicalis Reitter

Wetmore 16-116, 121: eaten by Oriole and Tanager.

in pods of *Inga laurina* at Lares (III-22 det. E. A. Schwarz), at Mayagüez (I No. 2231 det. as "sp." by W. S. Fisher); on flowers of *Inga laurina* at Adjuntas (I No. 3872-B); reared from maga pods at Vega Alta (I No. 5254).

Europs maculatus Groveller—det. W. S. Fisher

in rotten papaya fruit at Arecibo (I No. 5110-C).

Smicrips hypocoproides Reitter ?—det. W. S. Fisher

in rotten papaya fruit at Arecibo (I No. 5110-C).

CUCUJIDÆ

Nevermann, Ferd., "Beitrag zur Kenntniss der *Telephanus* (Col. Cucujidae)". *Settiner Ent. Zeitung*, Vol. 93, pp. 1-35, pl. 2. Settin, 1932.

Oryzaephilus (Silvanus) surinamensis L.

Van Z. (1512) in stored grain.

Wolcott 22b-6 & EEP-127: notes.

Danforth: at Mayagüez v-30, etc.

in corn (613-17), in rice (625-17), in dry dates (94-21, 317-23), in almonds (369-22), in chocolate candy (I No. 1767), in raisins (I No. 4280).

Silvanus gemellatus Jacq. Duval—det. GNW

in pods of "aroma", *Acacia farnesiana*, at Boquerón (101-23).

Ahasverus quadricollis Guerin—det. W. S. Fisher

on mangrove seed balls at Ponce (I No. 5208, 5208-B).

Ahasverus (Cathartus) advena Waltl

(as *Silvanus*) Gundlach,

(as *Cathartus*) Riley & Howard, in *Insect Life*, Vol. 6, p. 218.

Washington, D. C., February 1894: mention from P. R.

in green lima beans at Bayamón (I No. 3762), at Barce-loneta (I No. 3304-B); in dry pigeon peas at Bayamón (I No. 1168); in dry pods of *Inga laurina* at Juana Díaz (I No. 5078).

Cathartus cassiae Reiche—det. W. S. Fisher

in dry pigeon peas at Bayamón (I No. 1168 Leonard 32-136).

Cathartus rectus Leconte—det. W. S. Fisher

from dry pigeon peas at Bayamón (I No. 1168 Leonard 32-136).

Monamus concinnulus Walker—det. W. S. Fisher

(I No. 2447 Leonard 33-131); on *Eugenia* sp. at Ponce (I No. 5761 det. as "sp."); in bananas from R. D. (I No. 4255).

Nausibius clavicornis Kugelann

(as *N. dentatus* Marsham) Stahl. Gundlach.

Wolcott 22b-6 & EEP-129: in brown sugar, notes.

Laemophloeus adustus Leconte

Gundlach.

Laemophloeus unicornis Grouvelle

Leng & Mutchler.

Laemophloeus minutus Olivier

(as *L. pusillus* Schönherr) Leng & Mutchler 17-201.

Wolcott 22b-6 & EEP-127: in flour and soup pastes.

in wheat flour (1209-13, 291-17), in macaroni (620-17 det. R. T. Cotton) in seeds (651-17); on table (I No. 3706); in chocolate (I No. 2445).



Telephanus pallidus

Reitter. Twelve times natural size.

(Drawn by G. N. Wolcott.)

Telephanus pallidus Reitter

(as *T. pallidulus* Chevrolat) Wolcott 21-44, fig. 19: larvae and adults under leaf-sheaths of sugar-cane, and on dry banana leaves, notes. Wolcott 24-30: eaten by *Anolis cristatellus*.

Danforth: at Mayagüez xi-28 det. Nevermann, at Coamo Springs ii-32.

Nevermann 32-17 to 21: an extended discussion on the confusion of the names applied to the common P. R. species.

under leafsheaths of sugar-cane (391-12, 272-13, 359-13 det. E. A. Schwarz as *pallidulus*), at Camuy, Barceloneta and Corsica (GNW).

from letter of Herr Ferd. Nevermann of August 18, 1933: "The beetles you sent (45-33, from under leaf-sheath of sugar-cane at Río Piedras, July 28, 1933—five or six adults, one larva) are *Telephanus pallidus*, Reitter the same species you collected Feb. 23, 1920, also on sugar-cane.—*Telephanus*, as far as I could observe—feed always on the fungi which are always present in withered leaves. The larvae are feeding the same way, they are always to be found where the adults are living. The pupal state also takes place in the wrinkles of the leaves."

Telephanus pallidulus Chevrolat

Leng & Mutchler. Nevermann 32-22 to 24: quoting Chevrolat, TYPE from P. R. and Cuba.

in decaying flower stalk of banana at Bayamón (I No. 2424); on *Inga laurina* leaves at Adjuntas (I No. 3978).

Telephanus megacephalus Nevermann 32-12 to 14, pl. 1, fig. 4: TYPE from Krug collection, P. R.

Telephanus cubanus Nevermann 32-28 to 29, pl. 2, fig. 3: described from 41 specimens from Cuba and 2 from P. R. (Krug collection).

CRYPTOPHAGIDÆ

Loberus mutatus Grovelle—det. W. S. Fisher
in betel palm at Adjuntas (I No. 4783).

Loberus sp. "not testaceus"—det. W. S. Fisher
on orange at Adjuntas (I No. 4121).

Loberus testaceus Reitter

Leng & Mutchler 17-202.

(as sp.) Wetmore 16-66, 74: eaten by Tody, *Todus mexicanus*, and Flycatcher, *Anthracothonax aurentus*.

Wolcott 24-25, 30: eaten by *Anolis stratulus* and *A. cristatus*.
Danforth (& AMC): at Boquerón iv-29 det. Mutchler, at Mayagüez many records and dates.

(det. as sp. near *testaceus* by Mr. G. E. Bryant) in cotton bolls injured by Pink Bollworm at Pt. Cangrejos (400-22); in buds of majagua, *Partium tiliaceum*, at Arecibo (254-22); in pods of *Acacia farnesiana* at Boquerón (103-23); in dry pods of *Crotalaria incana* at Mameyes playa (70-33 det. W. S. Fisher); on ground at Ponce (I No. 3791); on *Inga laurina* leaves at Juana Díaz (I No. 3980); on tamarind flowers at Juana Díaz (I No. 4369).

MYCETOPHAGIDÆ

Typhaea fumata L.—det. W. S. Fisher
in dry *Crotalaria* pods at Pueblo Viejo (I No. 1180 Leonard 32-131).

Typhaea semirufa Chevrolat
Gundlach.

Litargus balteatus Leconte—det. W. S. Fisher

(as sp.) Wetmore 16-108: eaten by Northern Parula Warbler. on ♀ flowers at Ponce (I No. 3425), at Utuado (I No. 3725 det. as "sp.").

COLYDIDÆ

Synchita granulata Say

(as *Endeitoma*) Wetmore 16-108: eaten by Black & White Warbler.

under bark of *Inga vera* at Cayey (248-22 det. A. J. Mutchler, 1-23); under bark of fence post at Boquerón (172-23); in fungus on tree at Aibonito (I No. 5646); on decaying vegetation at Ponce (I No. 4955, 5848, det. as "sp.").

Asynchita sp.—det. W. S. Fisher

on dead wood at Villalba (I No. 5703).

Bitoma trifasciata Moritz

(as *Ditoma*) Leng & Mutchler.

Bitoma undata Guérin ?

Danforth (& AMC): at Joyuda, under bark of decaying almá-cigo tree, vi-30 det. Mutchler.

Aulonium bidentatum Fabricius

Gundlach. Leng & Mutchler.

Wetmore 16-108: eaten by Black & White Warbler, *Mniotilta varia*.

Lobogestoria gibbicollis Reitter—det. W. S. Fisher

in rotten wood at Ponce (I No. 5117), at Adjuntas (I No. 5194-B).

Penthelispa aqueicollis Reitter, Edm., 'Neue Colydidae des Berliner Museums'. Deutsche Ent. Zeitschrift, Vol. 22, No. 1 p. 123. 1878: TYPE from P. R.

Leng & Mutchler.

in decaying wood at Adjuntas (I No. 5085); in decaying fern frond at Yauco (I No. 5195).

Pycnomerus biimpressus Reitter—det. W. S. Fisher

on dead tree at Matrullas, Orocovis (I No. 5844).

Pycnomerus exartus Chevrolat

Champion, G. C., "A List of the Clavicorn Coleoptera of St. Vincent, Grenada and the Grenadines". Trans. Ent. Soc. London for 1898, p. 401: listed from P. R.

Neotrichus tuberculata Chevrolat

Leng & Mutchler.

Eulachus semifuliginosus Chevrolat

Gundlach. Leng & Mutchler.

Cryptozoon civile Schaufuss L. W., "Coleopteres aveugles de la Famille des Colydidae". Ann. Soc. Ent. France, (Ser. 6.) Vol. 2, pp. 46-48. Paris, 1882: TYPE from P. R.

Leng & Mutchler.

Cryptozoon nitidicole Schaufuss
Leng & Mutchler.

Ceryldon exaratum Chevrolat
Leng & Mutchler.

Ethelema sp.—det. W. S. Fisher
on *Inga vera* at Aibonito (I No. 4357); on pomarrosa at Aibonito (I No. 4775); on decaying leaves at Yauco (I No. 5605); another sp. on debris at Villalba (I No. 5667).

MONOEDIDÆ

Monoedus sp.—det. W. S. Fisher
on chinaberry at Adjuntas (I No. 4788).

LATHRIDIDÆ

"**Lathridus fasciatus** es su nombre en la collección del Museo de Berlin."
Gundlach.

Melanophthalma sp.—det. W. S. Fisher
on coffee at Ponce (I No. 3805).

PHALACRIDÆ

Phalacrus sp.—det. W. S. Fisher
at light (I No. 5596).

Olibrus parki Wollaston var. **erithacus** Chevrolat
(as *Eurestus erithacus*) Fauvel, Albert, "Notes Synonymiques",
Rev. d'Ent., Vol. 14, p. 106. 1895; listed from P. R.
(as *Eurestus* in Colydiidae) Leng & Mutchler. Leng & Mutchler
17-200: "Probably not more than a variety of *E. parki* Wollaston."

Olibrus sp. (possibly the above).

Wetmore 16-108: eaten by Northern Parula Warbler.

Leonard 32-136: commonly found breeding in dry pods of pigeon peas at Río Piedras during July and August.

on *Inga vera* at Aibonito (I No. 4359); on *Inga laurina* flowers at Adjuntas (I No. 3882); on orange leaves at Adjuntas (I No. 3986, 4122); on mocha leaves at Ponce (I No. 4120); on wild morning glory at Juana Díaz (I No. 4682); on fungus on tree at Aibonito (I No. 5647).

COCCINELLIDÆ

LITERATURE

A. Sicard,

"Descriptions de Varieties, Especies et Genres nouveaux appartenant a la Famille des Coccinellides." Ann. & Mag. Nat. Hist., Ser. 9, Vol. 9, pp. 349-360. London, April 1922.

Chapin E. A.,

"A New Genus of West Indian Coccinellidae (Coleoptera)." Proc. Biological Soc. Washington, Vol. 46, pp. 95-100, pl. 1. Washington. D. C., April 27, 1933.

Hyperaspis apicalis Mulsant (in Weise)

Gundlach. Leng & Mutchler. (as sp.) Jones 15b-13: notes. Wetmore 16-89, 108, 119: eaten by Martin, Parula Warbler and Mozambique.

Wolcott 21-45: common in cane fields, predaceous on *Sipha flava* Forbes. Wolcott 22-6: notes.

Danforth 26-119: eaten by P. R. Golden Warbler.

Danforth: at Cartagena Lagoon iii-31 det. Mutchler, La Plata iii-29, Barranquitas xii-30, Yauco xi-28, Lajas v-29. Naranjito xi-27, Coamo Springs ix-28, Algarrobo iii-31, etc.

AMC: at Aguadilla x-32, Utuado vii-30, and many others. on weeds in cane field (1-13, 75-13); feeding on aphids on okra (727-13 det. E. A. Schwarz); on sugar cane on which mealybugs were exposed by the leaf-sheath having been chewed away at Fajardo (909A-14); on flower spikes of *Heliotropium indicum* (191-16); feeding on *Aphis gossypii* Glover on cotton at Isabela (200-21); on sugar cane at Bayamón, Toa Baja, Caguas, Guánica and Patillas (GNW); (I No. 3547); on corn (I No. 2997), at Loíza; on string beans at Loíza (I No. 2182); on rice at Orocovis (I No. 3092); in orange grove and at light at Mayagüez (I No. 4823, 2422).

Hyperaspis connectens Thunberg (in Schönherr)

Gundlach. Leng & Mutchler.

Danforth: at San Germán iv-31 det. Mutchler, Aguada xi-27, Mayagüez viii-32, v-32, etc.

AMC: at Lajas iii-29, and several from Mayagüez.

on sugar cane at Guánica (517-13), at Aguirre (72-163), at Barceloneta, Córscica and Patillas (GNW—det. E. A. Schwarz); feeding on *Aphis gossypii* Glover on cotton at Isabela, more abundant than *H. apicalis* (199-21); on *Solanum indicum* at Mayagüez (I No. 3246, 3247).

Hyperaspis trilineata Mulsant—introduced

EEWI-239: recommending introduction into P. R. for control of mealybugs of sugar-cane.

introduced from Barbados, where collections and sendings were made by Mr. R. W. E. Tucker, on Dec. 10, 1932, releases of the beetles made at Isabela, Aguirre and Fajardo (174-32); another sending from Barbados received Feb. 8, 1935, beetles released at Cane Variety Garden at Arroyo, final sending received Feb. 20, 1935, in excellent condition, having been made in cigarette tins with perforated covers or covered with muslin, sent from Barbados by airmail, beetles released at Guánica, Hda. Santa Rita, Tablon 3 and Hda. María Antonia, Tablon 20(4-35).

Stethorus punctum LeConte—det. A. Sicard (as "close to *punctum* Lec." by E. A. Schwarz).

IPSup-39: on leaves of *Psidium guajava* and *Spondias lutea* (88-13, 722-16, 838-16).

Scymnus loewii Mulsant

Leng & Mutchler.

Van Dine 13-257; Van Dine 13-32; Jones 15b-13; Wolcott 21-45: feeding on *Sipha flava* Forbes on sugar cane.

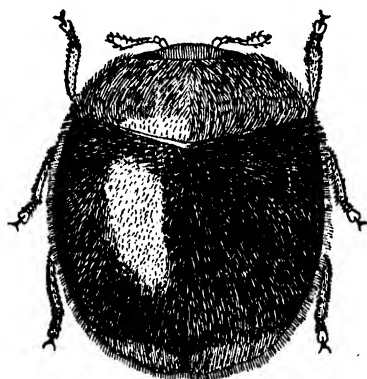
Wolcott 22-6: notes.

Danforth (& AMC): at Yauco iv-21, Cartagena Lagoon iv-31, Salinas iii-29, several records from Mayagüez.

feeding on *Sipha flava* Forbes on sugar cane at Guánica (167-11, 168-11 det. Schwarz); feeding on *Aphis gossypii* Glover on cotton at Guánica (120-13), at Isabela (201-21). on sugar cane at Patillas and Guánica (GNW); on Chinese cabbage at Jayuya (I No. 2570); feeding on aphids on pepper at Vega Baja (I No. 1405 Leonard 32-144).

Scymnus phaleus Mulsant

Gundlach. (as *S. phlocus* Mulsant) Leng & Mutchler.



Diomus roseicollis Mulsant. Thirty times natural size. (Drawn by G. N. Wolcott.)

Diomus (Scymnus) floralis F. var *roseicollis* Mulsant

(as *Scymnus floralis* F.) Gundlach. Leng & Mutchler.

(also as *S. roseicollis* Mulsant) Leng & Mutchler, not in synonymy.

(as *Scymnus floralis* F. var. *roseicollis* Muls.) Danforth: at Mayagüez x-29 det. Mutchler, Cartagena Lagoon iii-31, Yauco iv-31, etc. AMC: the above and at Algarrobo iii-31, etc.

Chapin 33-95: included in the genus *Diomus*.

(as *Scymnus roscicollis* Mulsant) the following:

Wetmore 16-66, 84, 96, 99, 108, 111: eaten by Tody, Wood Pewee, Vireo, Redstart. Yellow and Parula Warblers, and Honey Creeper.

Van Dine 13-257; Van Dine 13-32; Jones 15b-13; Jones 14-462; Wolcott 21-25: predaceous on *Sipha flava* Forbes on sugar cane.

Jones 15b-17: predaceous on *Aphis setariae* Thos. on sugar cane.

Wolcott 22-6: notes and illustrations of larva, pupa and adult.

feeding on *Sipha flava* Forbes on sugar cane (439-12, 607-12, 691-12), at Guánica (167-11, 168-11 det. Schwarz) at Villalba (77-24); on *Aphis setariae* Thos. on sugar cane (946-13); on *Aphis gossypii* Glover on cucumbers (421-12), at Isabela (201-21); on aphids on okra (574-12, 728-13); (as *Diomus* det. E. A. Chapin) on *Guilandina crista* at Ponce (I No. 3076); on string beans (I No. 3276), at Loíza (I No. 3548); on corn at Loíza (I No. 2183); on peppers at Humacao (I No. 3830); at light at Mayagüez (I No. 2422); on guava (I No. 2514, 2516); in orange grove at Mayagüez (I No. 4824).

***Diomus thoracicus* F.**

(as *Scymnus thoracicus* F.) Gundlach, with *S. ochroderus* Mulsant in synonymy.

(as *S. ochroderus* Mulsant) Leng & Mutchler.

Chapin 33-95: type of the genus, possesses antennae of eleven segments and tarsi of four segments.

***Decadiomus pictus* Chapin, 33-97, fig. 10:** TYPE from Dorado, P. R., collected as larvae feeding on *Icerya purchasi* Maskell, reared to adult by F. Seín.

Böving, Adam G., "Description of the Larva of *Decadiomus pictus* Chapin (Scymnini, Coccinellidae)." Proc. Biological Soc. Washington, Vol. 46, pp. 101-104, pl. 1. Washington, D. C., April 27, 1933: an extended description.

Wolcott & Seín 33-213: discovery and rearing of the type material.

larvae predaceous on *Icerya purchasi* at Dorado (133-32 TYPE) similar to those of *Rodolia cardinalis* found with the latter on casuarina tree where beetle releases had been made, but pupated when much smaller and emerged a few days later as light red beetles, with two large black spots on each elytron. First collection July 11, 1932; three larvae and three pupae found on small citrus tree in nursery nearby, Sept. 12, 1932; at Ponce (I No. 4491), on guácima flowers (I No. 4514); at Yauco (I No. 5737 det. as "sp.").

***Decadiomus tricusps* Chapin 33-98, fig. 5:** TYPE "from Río Piedras, P. R., January 21, 1925 H. L. Dozier, collected on *Carica papaya*, feeding on *Metaleurodicus* sp."

reared from larvae feeding on *Aleyrodes variabilis* on pa-

paya at Stop 23 (Santurce) in a private garden; both the larva and pupa are a soiled white without markings, and covered with fine hairs (7-25 TYPE).

Cryptolaemus montrouzieri Mulsant—introduced

Van Dine 12-20: "introduced by this Station from California last season, has been distributed throughout all of the cane districts and has been recovered already from the field."

Van Dine 13-256; Van Dine 13-30; an enemy of *Pseudococcus sacchari* Ckll.

Hooker 13-37: introduced against *Pseudococcus citri*.

Leng & Mutchler 14-411: "(introduced)."

Wolcott 22d-17: the introduction from California, distribution in cane fields in Porto Rico to feed on mealy-bugs of sugar cane and subsequent recovery feeding on other mealy-bugs, and on fleshy scale-insects, but not on *Pseudococcus calceolariae* Maskell and *P. sacchari* Ckll., which are protected by the leaf-sheaths of the sugar cane.

Wolcott 24-30: eaten by *Anolis cristatellus*.

Dozier 25-361: abundant in cane field, feeding on *Pulvinaria iceryi*.

EEP-15: note. EEWI-239: introduction into P. R.

Danforth: at Aguadilla xi-27, Boquerón iii-29, etc.

feeding on *Pseudococcus citri* Risso on acalypha (31-25), on bucare trees, *Erythrina glauca* (42-21); feeding on *Pulvinaria psidii* Maskell on *Rauwolfia nitida* at Guánica (317-21) at Aguadilla (122-31); on aphid-infested cotton at Guánica (105-13); on guava bushes at Rincón (39-34); abundant on ? tree at Peñuelas (49-24); in curled-up leaves of *Ficus laevigata* at Quebradillas (240-23); on *Scirpus validus* at Ponce (I No. 4499).

Rodolia (Vedalia) cardinalis Mulsant—introduced

(as "Australian ladybeetle" and "Vedalia") Leonard 32-1105 and 1106: introduction into P. R. for control of cottony cushion scale, *Icerya purchasi* Maskell.

"Florida Beetle Put to Test, Curbing P. R. Citrus Pest." The Produce News, New York, June 11, 1932: popular account of the above introduction.

Wolcott & Seín 33-213: a more extended account.

Wolcott 32-410: as affected by the hurricane of San Ciprián. at San Juan (148-32), abundant in April (10-34); widely distributed around Bayamón (28-34); natural spread to Espinosa (40-33), to west of Arecibo from Vega Baja (4-36).

Psorolyma maxillosa Sicard 22-360, TYPE from Lares, Porto Rico:

"Ovalis, convexa nitida, coerulea; subtus piceo-brunnea; antennis, palpis, pedibusque pallide flavis. Mandibulis exsertis, oculis prominentibus distinctissimus. —Long 2.5 mm."

Danforth: at Las Marías i-31 det. Chapin, Maricao iii-29, Lares vii-31, El Yunque ii-27, Cartagena Lagoon iii-31.

Wolcott 24-33: eaten by *Anolis gundlachi*.

on coconut palm (149-22); on coffee leaves at Lares (98-21 TYPE, 132-21, 294-21, 473-21, 294-22), at Adjuntas (I No. 3998, 4012), at Mayagüez (262-23, I No. 3962), at Utuado (I No. 2522), also at San Sebastián, Corozal, Ciales and most abundantly in the mountains north of Yauco (201-23). The larva is grey with black spots, and often two or three occur on a single leaf, without apparent source of animal food. seldom found on young leaves infested with *Toxoptera aurantiae* Boyer.

Scymnillus nunenmacheri Sicard 22-355, TYPE from Río Piedras, Porto Rico: "Subrotundatus, convexus, nitidus; supra nigropiceous, thoracis lateribus luteis; subtus brunneo-piceous, antenni, palpis pedibusque rufo-flavis. —Long 1.2-1.5 mm."

EEWI-395: the only native scale-feeding lady-beetle in P. R. citrus groves.

abundant on citrus trees at Vega Alta (217-17); feeding on *Chrysomphalus dictyospermi* Morgan on *Cycas revoluta* (171-17), at Naguabo (335-17); feeding on *Aspidiotus destructor* Sign. on coconut palm (352-21 TYPE).

Scymnillus variipennis Sicard 22-354, TYPE from Río Piedras, Porto Rico: "Breviter ovatus, convexus, nitidus; supra rufus, elitris basi nigricantibus, subtus rufescens; antennis, palpis pedibusque flavis. Oculis nigris. —Long 1.5 mm."

(as sp.) Wetmore 16-66, 84, 98, 104, 108, 111: eaten by Tody, Wood Pewee, Vireo and Warblers, and Honey Creeper.

bluish-grey larvae, reddish-brown puparia and adults abundant on leaves of coconut palm infested with *Aspidiotus destructor* Sign. (350-21 TYPE), at Ponce (947-13); on leaves of *Psidium guajava* infested with whitefly, *Aleurodicus minima* Quaint., and mealybugs, *Pseudococcus nipae* Mask. (217-13, 274-13); on leaves of *Spondias jobo* infested with thrips, *Heliothrips rubrocineta* Giard (783-16); feeding on *Pseudococcus citri* Risso on grapefruit (235-17).

Scymnillodes cyanescens Sicard var. **volaceus** Sicard 22-358, TYPE variety from Río Piedras, Porto Rico: "Subrotundus, convexus, nitidus, supra cyaneus; antennis flavis, palpis rufis; subtus nigro-brunneus; pedibus rufis. Long 1.5 mm. ---var. **violaceus** nov., Elytris violaceo-micantibus. Prothorace angustiore."

EEP-79: of importance in the control of scale on coconut palm. Danforth: at Coamo iii-29 det. Mutchler, Salinas iii-29, Yauco iv-31, Mayagüez ii-31.

feeding on *Aspidiotus destructor* Sign. on coconut (353-21 TYPE); feeding on *Asterolecanium bambusae* Bdv. at Vega Alta (41-17, 218-17).

Scymnillodes gilvifrons Chapin, E. A., "New Coccinellidae from the West Indies". Jour. Washington Academy of Sciences, Vol. 20, No. 20, pp. 488-495. Washington, December 4, 1930: TYPE from Maricao, P. R., "elytra metallic violaceous—easily recognizable by the brilliant yellow pubescence on head and pronotum, length 1.5 mm."

in coffee grove at Adjuntas (I No. 2248, 2960); on *Inga vera* at Ponce (I No. 3433); at light at Mayagüez (I No. 2422); in orange grove at Barceloneta (I No. 1241 Leonard 32-143, 3657), at Adjuntas (I No. 3479), at Ponce (I No. 3804).

Psyllobora nana Mulsant

Danforth: at Boquerón iii-29, Yauco iii-29, Ponce i-31, Villalba xi-30.

AMC: at Mayagüez, xi-34, xii-33, Ponce xii-31, i-31, Salinas xii-33, Río Piedras ix-31.

feeding on red spider on beans (204-16, 428-16); on cotton at Isabela (203-22), at Quebradillas (306-22), at Guánica (38-22); on sugar cane at Martín Peña and Seboruco (Pt. Cangrejos) (GNW—det. E. A. Schwarz); on string beans at Loíza (I No. 3551); on *Scirpus validus* at Juana Díaz (I No. 4486); on cashew (I No. 2160 Leonard 33-134); at Parguera (I No. 3906); at Seboruco (26-24).

Psyllobora lineola Fabricius

Gundlach. Danforth: at Ponce 1-3 det. Mutchler, Guayama iii-29.

elytra mostly yellow with several small black spots, on Isle of the Caves, Laguna de San José, Pt. Cangrejos (96-15); on cotton at Boquerón (92-23); on corn (I No. 2998).

Megilla innotata Mulsant

Stahl. Gundlach. Leng & Mutchler.

Van Z. (5058) predaceous on *Sipha flava* Forbes.

Wolcott 22-6: notes.

Van Dine 13-257; Van Dine 13-32; Jones 15b-12; Wolcott 21-45: predaceous on *Sipha flava* Forbes.

Danforth: at Cartagena Lagoon ii-27 det. Leng. ii-30 and many other dates, Florida vii-30.

AMC: at La Plata iii-27, Río Piedras iii-32.

determined by E. A. Chapin as *Ceratomegilla*, on pepper leaf at Vega Alta (I No. 1648—Leonard 33-131); feeding on aphids on honeydew melons at Barceloneta (I No. 3286). on sugar-cane (207-11, 30-12, 223-13), at Naguabo (33-10 as *Megilla* det. E. A. Schwarz). at Humacao (56-10); feeding on *Sipha flava* Forbes on sugar cane (614-12), on aphids on okra (729-13), on aphids on beans (444-16); abundant on flowers of *Verbesina*, *Mitracarpus* and other weeds, apparently feeding on pollen (500-16).

Hippodamia convergens Guerin—introduced

Van Z. (5050) predaceous on *Aphis* spp.

Hooker 13-37: introduction from California.

Leng & Mutchler 17-200: questioned.

Cycloneda sanguinea Linnaeus

(as *Daulis*) Stahl. (as *Neda*) Gundlach.

Leng & Mutchler. Van Z. (5093) predaceous on *Aphis* spp.

(as *C. limbifer*) Wetmore 16-61, 66, 77, 80, 84, 87, 98: eaten by Ani, Tody. Petchary, Wood Pewee, Elainea, Cliff Swallow and Vireo.

Van Dine 13-257; Van Dine 13-32; Jones 15b-12; Wolcott 21-45: predaceous on *Sipha flava* Forbes. Wolcott 22-6: notes.

Wolcott 24-33: eaten by *Anolis gundlachi*.

Leonard 32-134: eating *Sipha flava* Forbes.

Leonard 32-1106: attacking cottony cushion scale.

Wolcott & Sein 23-213: quoting Leonard.

Leonard. M. D. "A Braconid Parasite on a Coccinellid new to Puerto Rico". Jour. Ec. Ent., Vol. 26, No. 1, p. 294.

Geneva, N. Y., February 1933: *Homalotylus terminalis* Say parasitizing pupae of *Cycloneda sanguinea* L., predaceous on *Sipha flava* Forbes.

Danforth and AMC: many records.

on leaves of sugar cane infested with *Sipha flava* Forbes (13-12, 347-12 det. Schwarz), at Guánica (233-11), at Guayama (170-12), at Añasco (370-12), at Canóvanas (717-12), at Trujillo Alto (723-12), at Toa Baja (143-13); reared on these aphids, yellow-spotted black larvae hatching from a small cluster of bright yellow eggs on April 20 & 21, pupating April 30 to May 2, adults issuing May 5 & 6 (417-12, 617-12, 665-12); at Aibonito (SSC), on dry hill north of Ponce (117-13); larvae and adults observed feeding on *Cerataphis lantaniae* Bdl. on palm (43-21); on *Carolinaia cyperi* Ainslie on sedge, *Cyperus rotundus*, at Bayamón (55-21); on *Aphis gossypii* Glover on cotton at Isabelá (198-21); on aphids on okra (730-13); some of the following identified by H. S. Barber as *C. limbifer* Casey: at Villalba (I No. 5173); on lima beans (I No. 1754), at Loíza (I No. 1697), at Vega Baja (I No. 1689); on pepper at Humacao (I No. 3830), at Vega Alta (I No. 1649), at Vega Baja (I No. 620), at Bayamón (I No. 603); on potato at Cidra (I No. 645); on eggplant at Manatí (I No. 576), at Bayamón (I No. 591).

Daulis ferruginea Olivier

(as *Neda*) Gundlach. Leng & Mutchler.

Wolcott 23-57: on coffee.

Danforth: at Las Marías iv-27, Utuado vii-30, Mayagüez vi-32, Aguada xii-32, Yauco xii-32, Jayuya xii-32, and many others.

AMC: many records.

larvae, pupae and adults quite abundant at Adjuntas, top of the pass to Ponce, on coffee leaves, although no aphids were present (485-21 det. E. A. Schwarz as *Daulis*, by A. Sicard as *Cycloneda*), in mountains north of Yauco (113-22), at Aibonito (693A-17); on *Inga laurina* infested with Psyllids, probably *Psyllia minuticonia* Crawford, at Lares (146-22); on window curtain at Mayagüez (256-23); on orange at Adjuntas (I No. 3993); on banana at Adjuntas (I No. 2573).

Exochomus sp.—det. G. E. Bryant, or **Pentilia** sp.—det. E. A. Chapin Wolcott 24-30; eaten by *Anolis cristatellus*.

a blue-black beetle, eaten by lizard on the beach at Condado, apparently quite abundant, as others had been eaten by this and another lizard; another specimen, densely pilose, noted on shrub at Pt. Cangrejos a few days later—a single specimen mounted, from stomach of lizard (302-23); another densely pubescent specimen from palm frond at Mameyes (343-22).

Coccinella sp. ?

Wetmore 16-80; eaten by Petchary.

ALLECULIDÆ (CISTELIDÆ)

Allecula flavipes Jacq. Duval

Leng & Mutchler. (in synonymy with *A. fuscula*) Gundlach.

Hymenorus fuscula Schönherr

(as *Cistela sobrina* Dejean) Stahl.

(as *Allecula*) Quedenfeldt 86-119. Gundlach. Leng & Mutchler.

(as *Hymenorus* sp.—det. E. A. Schwarz, possibly *fuscula* Schönherr—det. K. G. Blair): IP-96.

(as sp.) Wolcott 24-3: seven individuals in 3 sq. ft. of pasture at Pt. Cangrejos.

(as sp.) Wolcott 24-11: eaten by *Ameiva exsul*.

Danforth: at Mayagüez iii-30 det. (?) Mutchler, Aguada iv-30.

very abundant on *Corchorus hirsutus* at Pt. Cangrejos (80-16, 228-23), in dry sea-weed and under dead vegetation and at light (GNW); at light in Condado (183-16), at Pt. Salinas (292-22); in cotton squares and in empty pupa skins of *Alabama argillacea* Hübner close to the beach at Hatillo (203-22, 304-22); under bark of *lignum-vitæ* at Guánica (GNW); on "húcar" at Ponce (I No. 4685); (as "sp." I No. 5808) and at Ponce (I No. 4472, 4777).

TENEBRIONIDÆ

Diastolinus fuscicornis Chevrolat, A. A. M., Ann. Soc. Ent. France,

(5), VII, Bulletin p. vii, 1877: TYPE from P. R.

Gundlach. Leng & Mutchler.

Sellio probably *tibidens* Quedenfeldt—det. K. G. Blair
under cow dung at Boquerón (171-23), at Salinas (282-23).

Hopatrinus pullus Sahlberg (= *anthracinus* Mulsant)—det. E. A. Schwarz.

Danforth: at La Tortuguera iii-27 det. Mutchler, Ensenada iv-31.

AMC: at Mayagüez ix-31, xii-32, Añasco ix-30, Coamo vi-30.
from base of decaying pineapple slip (705-12).

Trientoma varvasi Solier—det. C. W. Leng

Danforth: at Ensenada ii-27.

AMC: at Guánica iv-31.

Blapstinus punctatus F.

Danforth: at Mayagüez x-28 det. Mutchler, La Plata iii-29,
Algarrobo doing great damage to seedling tobacco and melons
ii-31, Joyuda x-29, San Germán vi-30, Humacao xi-30.

AMC: at La Tortuguera iii-27, Faro de Cabo Rojo iii-31, Coamo
Springs xi-30, iv-32, Boquerón vi-32, Guánica ii-27, Luqui-
llo vii-32.

very abundant in soil in cane field at Guánica (654-14 det.
as "sp." by Dr. E. A. Schwarz, as "possibly *punctatus* F." by K. G. Blair)—"whenever an old stool of cane was broken
up, large numbers of beetles would scurry to cover. The
smallest piece of trash or chunk of dirt seemed to afford all
the concealment necessary"; under dry cow dung at Boquerón
(93-23), at Salinas (283-23); on ground at Jayuya (I No.
2519); at light (I No. 4721 det. as "sp." E. A. Chapin).

Blapstinus striatulus Melsh. ?—det. E. A. Chapin

reported as attacking sprouting cotton seedlings at Isabela
(161-31).

Trachyscelis sp. nov.—det. E. A. Chapin

Danforth: at Río Piedras vii-31.

IP-96: as (?) *flavipes* Melsheimer—det. K. G. Blair.
on the beach at Pt. Cangrejos (108-23).

"near *Lorelus*"—det. E. A. Chapin

in decaying wood at Villalba (I No. 5733).

Phaleria angustata Chevrolat—det. E. A. Schwarz

in seaweed on the beach at Pt. Cangrejos (GNW, 109-23),
at Pt. Salinas (293-22); on the beach at Ponce (I No. 5621
det. as "sp.").

Phaleria variabilis Quedenfeldt, G., 86-128, TYPE from P. R.

Gundlach, "esta especie varía mucho en su colorido que puede
ser totalmente el pálido amarillo hasta casi el solo negro o
amarillo con una mancha común oscura en forma de luna sobre
el disco de los elitros."

P. angustata shows the same variation in color.

larvae and adults in claws of dead crabs on the beach at
Isabela (160-31 det. E. A. Chapin).

Crypticus sp. possibly **obsoletus** Say—det. E. A. Schwarz.

Wetmore 16-39: eaten by Killdeer.

Wolcott 24-3: thirteen individuals in 3 sq. ft. of pasture at Pt. Cangrejos.

in seaweed on the beach at Pt. Cangrejos (GNW).

Rhipidandrus micrographus Lacordaire—det. E. A. Schwarz

larvae and adults abundant in polypore fungus, *Fomes australis*, at Jájome Alto (373-21), at Adjuntas (482-21).

(Eledona pectinicornis

Gundlach, "en el Museo de Berlín, acaso manuscrito".)

Diaperis hydni Fabricius

Stahl. Gundlach.

(as *D. maculata* Olivier) Leng & Mutchler 17-214.

Danforth: at Humacao xi-30 det. Mutchler, Añasco ix-30, Mayagüez ix-30.

AMC: at Barranquitas xii-30, etc.

all stages abundant in polypore fungus (355-12 det. E. A. Schwarz, 109-15), in *Polyporus palmarum* on rotten coconut palm (206-11), at Mameyes (37-34).

Palembus ocularis Casey—det. E. A. Schwarz

Wolcott 24-31: a single individual in 3 sq. ft. of pasture at Pt. Cangrejos.

all stages in tamarind pods, feeding on seeds, at Loíza (344-21); at Cabo Rojo (I No. 309); on *Scirpus validus* at Ponce (I No. 4692).

Platydemia apicale Castelnau & Brulle

Gundlach.

Platydemia excavatum Say—det. G. E. Bryant

under bark of dead tree at Vega Baja (113-16).

Platydemia picicorne Fabricius

Gundlach.

(as sp.) Wetmore 16-63, 116, 128: eaten by Woodpecker, Oriole and Grasshopper Sparrow.

at Aibonito (I No. 5806 det. as "sp.").

Phatydemia virens Castelnau & Brulle

Wetmore 16-108: eaten by Black & White Warbler.

Gnathocerus cornutus F.—det. H. S. Barber

(I No. 19-B Leonard 33-131); on tree fungus at Aibonito (I No. 5648 det. as "sp." E. A. Chapin).

Tribolium ferrugineum Fabricius

Wolcott 22b-6: in flour. (as *Margus*) Gundlach.

Danforth (& AMC): at Añasco ix-30, Mayagüez ix-30 and many others.

EEP-127: an economic account.

(I No. 4860), in bran (35-12), in wheat flour (1208-13 det. E. A. Schwarz, 141-16, 7-21), in dry dates, (95-21); at Aibonito (SSC); in cotton-seed meal stored in tobacco warehouse at Cayey (371-22); in dry tamarind pods at Guánica (544-14); in chicory beans (I No. 1621); in peas at Ponce (I No. 2564); in chick peas (I No. 2880-B); at light at Bayamón (I No. 3362).

***Tribolium confusum* Jacq. Duval**

Leng & Mutchler 17-214: recorded by Van Zwaluwenburg.

Danforth (& AMC): at Mayagüez ix-30 in bran, v-30, at Añasco ix-30, etc.

(I No. 4886); in cotton-seed meal stored in tobacco warehouse at Cayey (372-22).

***Dioedus* sp.—det. E. A. Chapin**

at Yauco (I No. 5198) in decaying tree fern at Adjuntas (I No. 5506); in decaying wood at Villalba (I No. 5683, 5700, 5706, 5707).

***Alphitobius diaperinus* Panzer—det. R. T. Cotton**

in wheat flour (9-21); in feed store-room at Ponce (I No. 2566).

***Alphitobius piceus* Olivier**

(as *Heterophaga fagi* Panzer) Gundlach, "encontrado en almacenes y en lugares donde existen sustancias descompuestas, secas." Also, with *Tenebrio mauritanicus* Fabr. in synonymy.

Leng & Mutchler 17-214: recorded by Gundlach.

(I No. 5358).

***Sitophagus hololeptoides* Castelnau**

Leng & Mutchler.

(as *Adelina livida* Chevrolat) Gundlach, "Acaso el nombre es manuscrito." Also (as *Hypogena*) Gundlach.

***Lorelopsis* sp.—det. E. A. Chapin**

at Yauco (I No. 5198).

***Tenebrio molitor* L.**

Danforth: at Mayagüez ix-30, xi-28 and many other dates, Villalba vi-30.

AMC: at Cabo Rojo xi-31, Desecheo Id. v-27, Utuado vii-30, Coamo Springs iv-31, La Plata xii-26, Río Piedras vii-31, Ponce xii-33.

***Tenebrio obscurus* F.**

Danforth: at Mayagüez ix-30, xi-30 and many other dates.

AMC: at Añasco ix-30, Algarrobo iii-31, many records at Mayagüez.

***Doliema pallida* Say—det. K. G. Blair**

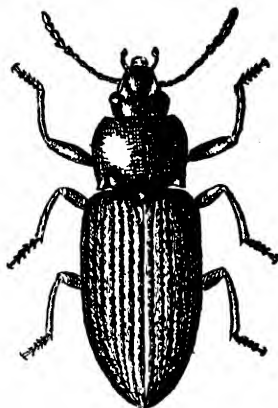
under bark of fence post at Boquerón (187-23).

Hypophloeus rufipes Fabricius—det. E. A. Schwarz

under bark of decaying búcare tree, *Erythrina glauca*, at Cayey (301-17, 359-22).

Helops sp.

Wetmore 16-63, 82, 96, 98, 108, 116: eaten by Woodpecker, Flycatcher, Wood Pewee, Vireos, Warblers and Oriole.



Zophobas rugipes Kirsch.
Twice natural size. (Drawn
by F. Maximilien.)

Zophobas rugipes Kirsch

Leng & Mutchler. AMNH at Corozal Cave.

Danforth: at Mayagüez x-27, Ponce i-31, Añasco ix-31, Utuado vii-30, etc.

AMC: at Yauco xii-32, Aguadilla xii-32, Florida vi-31, Toa Baja xii-32, Luquillo vii-32, many records at Mayagüez.

(10-11, 55-11, 444-19), under boards in barn (122-15), at Bayamón (342-16), at Caguas and Aibonito (SSC).

Zophobas morio Fabricius

Stahl. Gundlach. "se encuentra en las casas debajo de tablas, cajones, etc. Nunca lo he visto en el campo".

Van Z. (P. R. 25).

Leng & Mutchler 17-214: on Culebra Island.

(as sp.) Wolcott 24-11: eaten by *Ameiva cxsul*.

May 27-6: eaten by Surinam toad, *Bufo marinus*.

Pyranisia tristis Castelnau

(as *Cymatothes*) Stahl. Gundlach.

Strongylium pulvinatum Macklin, F. W., Acta Soc. Sci. Fennicae

Vol. 8, No. 1, p. 265. 1867: TYPE from P. R.

Leng & Mutchler.

(as sp.) Wetmore 16-96: eaten by Latimer's Vireo.

MONOMMIDÆ

Aspathines aeneus Thomson—det. E. A. Chapin
on mangrove at Ponce (I No. 4690); in dead wood at
Guayanilla (I No. 5484 det. as "sp.").

Hyporhagus marginatus Fabricius
(as *Monomma*) Stahl. Gundlach.

MELANDRYIDÆ

Cteniacantha marginata Quedenfeldt, G., 86-121, TYPE from P. R.
Gundlach 94-629: under Cistelidae.
Leng & Mutchler 14-465.
on orange at Ponce (I No. 4365), at Adjuntas (I No. 3979
det. as "prob.").

Scraptia sp.—det. E. A. Chapin
on orange at Ponce (I No. 3801).

Canifa sp.—det. E. A. Chapin
on mangrove at Guánica (I No. 5678).

Conomorpus sp.—det. E. A. Chapin
on *Ficus* at Adjuntas (I No. 3482); on moca at Adjuntas
(I No. 3985); on grapefruit at Palo Seco (I No. 5296).

PTINIDÆ

Atractocerus brasiliensis Laporte & Serville
Gundlach, "Solamente la he cogido cuando voló a la vela en-
cendida en las casas de campo. Su vuelo es ruidoso o acom-
pañado de un zumbido."
Leng & Mutchler.

Ptinus sp.
Wetmore 16-108: eaten by Northern Parula Warbler.

ANOBIIDÆ

The descriptions of new species in this family were especially
prepared for publication here by Mr. W. S. Fisher as Bur. Ent. &
P. Q. M. S. 3235.

Sitodrepa panicea L.—det. W. S. Fisher
at light at Mayagüez (I No. 2422 Leonard 33-132).

Trichodesma oakleyi Fisher, new species
Very robust, brownish black, moderately shining, densely,
irregularly variegated with recumbent, blackish, brownish
yellow, and whitish pubescence, with numerous fine, erect
hairs intermixed, the whitish pubescence on each elytron
forming a more or less distinct spot at middle and a smaller

spot along sutural margin near apex. Antennal club subequal in length to preceding joints united. Pronotum strongly gibbose on disk, with two tufts of brownish-black hairs; sides very strongly sinuate posteriorly; surface densely granulose. Elytra seriatly punctate, each with five tufts of erect hairs, two in front of middle, the inner one elongate, and three rounded ones arranged transversely (slightly obliquely) at apical third. Beneath densely pubescent, rather densely granulose, except the intermediate abdominal segments, which are simply punctate. Length, 5.5 mm; width, 3 mm.

Type in United States National Museum, collected at the Díaz Finca, Aibonito, P. R., June 8, 1934, by R. G. Oakley (I No. 5631).

Differs from *cristata* Casey by the different arrangement of the pubescence and tufts of hairs on the dorsal surface, and in having the pronotum very strongly sinuate posteriorly and the elytra seriatly punctate. Name, description and notes by W. S. Fisher.

***Lasioderma serricorne* Fabricius—det. D. L. Van Dine**

Tower 10-26: "a beetle borer in tobacco warehouses, doing a great deal of damage to the stored leaf." Control by fumigation with cyanide.

Danforth: at Mayagüez, in meal and tobacco seed, det. Mutchler.

EEP-100: "La Carcoma del Tabaco"—an economic account.

Tower 24-11: demonstrating the use of liquid hydrocyanic acid in fumigating tobacco.

Wolcott 24-25: eaten by *Anolis stratulus*.

in books (44-12), in flour (1210-13), eating the string on which camandula, *Coix lachryma-jobi*, beads were strung (105-16); at Aibonito (SSC); in cotton-seed meal stored in tobacco warehouse at Cayey (373-22); in stored tobacco at Cayey (374-22); on tomatoes on dock (I No. 791); in binding of book (128-32); in desk (I No. 1801, 2096, 4866, 5225); in dry onion seeds (23-25); in chocolate (I No. 2222); in pepper (I No. 2338); in pumpkin fruit (I No. 5049); resting on carambola fruit at Mayagüez (I No. 1549).

***Petalium puertoricensis* Fisher, new species**

Moderately elongate, subopaque, uniformly reddish brown (palpi, antennae, and tarsi yellowish), sparsely clothed with short, recumbent, whitish or yellowish hairs. Head coarsely, densely reticulate-punctate. Pronotum slightly uneven, lateral oblique depressions well developed, anterior margin thickened and reflexed; densely, confluent punctate. Elytral striae unimpressed, except the two marginal ones, which are quite deep; stria punctures coarse basally, becoming finer and more distant toward apices; intervals densely, obsoletely granulose. Beneath coarsely, densely punctate; second abdominal segment subequal in length to the following three

segments united. Length, 1.22–1.75 mm; width, 0.5–0.75 mm.

Type and 5 paratypes in United States National Museum. The type and 2 paratypes were collected on dead wood at the Noyes Finca, Ponce, P. R., February 16, 1934 (I No. 5499); 2 paratypes were collected on "húcar" at the Pagán Finca, Juana Díaz, P. R., August 14, 1933 (I No. 4490); and 1 paratype was collected on "moca" at the Vives Finca, Ponce, P. R., May 4, 1933 (I No. 4128); all were collected by R. G. Oakley.

Differs from *bistriatum* Say in being more closely punctured and distinctly pubescent. Name, description and notes by W. S. Fisher.

Catorama herbarium Chevrolat—det. W. S. Fisher

(as sp.) Wetmore 16–66, 72, 74: eaten by Tody and Hummingbirds.

in library—in bindings of books (132–32); at light at Bayamón (I No. 5244).

Catorama insulicola Fisher, new species

Oblong-oval, strongly convex, moderately shining. uniformly reddish brown, sparsely clothed with fine, recumbent, yellowish pubescence. Head and pronotum densely, finely punctate, with numerous coarser punctures intermixed; each elytron with two deep, lateral striae extending from middle to near apex. Anterior tibia bisulcate externally. Middle tibia without a marginal groove. Metasternum carinate anteriorly, sparsely punctate at middle, the punctures obsolete toward sides. Length, 2 mm; width, 1.08 mm.

Type in United States National Museum, collected on "húcar," on beach, Tallaboa road near Ponce, P. R., August 21, 1933, by R. C. Oakley (I No. 4506).

Differs from *triviale* Fall in being more broadly rounded posteriorly and in having the metasternum longitudinally carinate anteriorly. Name, description and notes by W. S. Fisher.

Cryptorama densipunctatum Fisher, new species

Oblong-oval, strongly convex, feebly shining, uniformly dark reddish brown (palpi, antennae, and legs paler), sparsely, irregularly clothed above with long, recumbent, vortical, whitish pubescence, very densely, finely, deeply, uniformly punctate throughout. Length, 1.38–1.85 mm.; width, 0.75–1 mm.

Type and 2 paratypes in United States National Museum, collected at the Rufina Finca, Ponce, P. R., May 9, 1934, by R. G. Oakley (I No. 5494).

Differs from *holosericeum* LeConte in having the pubescence on the pronotum and elytra distinctly longer and more vortical, but not forming a dark spot on each elytron. Name, description and notes by W. S. Fisher.

Protheca flavitarsis Fisher, new species

Oblong-oval, strongly convex, subopaque; uniformly reddish brown (palpi, antennae, and tarsi yellowish), densely, irregularly clothed with long, recumbent, vortical, whitish or yellowish pubescence, giving the surface a variegated appearance. Antennae 11-jointed. Head finely, densely punctate. Pronotum finely, densely punctate or granulose, with numerous coarser punctures intermixed, especially toward the sides.

Scutellum as long as wide. Elytra finely, densely punctate or granulose, not striate, but with series of coarse punctures, which are more distinct at the sides. Beneath finely, densely punctate or granulose, with numerous coarser punctures intermixed. Length, 1.25–1.75 mm; width, 0.75–1 mm.

Type and 3 paratypes in United States National Museum. The type was collected on coffee leaves at the Mercedita Central Finca, Ponce, P. R., November 21, 1932 (I No. 3191); 2 paratypes were collected on moca and orange at the Vives Finca, Ponce, P. R., May 4, 1933 (I Nos. 4127 and 4131); and the other paratype was collected on cacao at the Vázquez Finca, Ponce, P. R., March 10, 1933 (I No. 3799); all were collected by R. G. Oakley.

Differs from *hispida* LeConte in being more finely punctured and in having the pubescence on the elytra more vortical.

Name, description and notes by W. S. Fisher.

Dorcatoma bibliothecarum Poey

Gundlach. "sumamente dañino, porque su larva perfora libros y destruye colecciones de historia natural, tanto zoológicas como botánicas".

(as *Calymmanderus*) Leng & Mutchler 17-206; recorded by Gundlach.

Caenocara oakleyi Fisher, new species

Rotundate-oval, strongly convex, strongly shining, uniformly reddish brown to brownish black (palpi, antennae, and anterior legs paler), pubescence sparse, long, erect, yellowish, more or less arranged in rows on elytra. Eyes incised for one-half their length in the female and two-thirds their length in the males. Above very sparsely, finely, irregularly punctate. Beneath more coarsely punctate. Length, 1.38–1.68 mm.; width, 1–1.13 mm.

Type and 9 paratypes in United States National Museum. The type and 3 paratypes were collected on *Inga vera* at the Serrallés Finca, Ponce, P. R., October 11, 1932 (I No. 3433); 4 paratypes were collected on the same host at the Paraíso Finca, Ponce, P. R., February 27, 1933 (I No. 3722); and 2 paratypes were collected on orange at the Salich Finca, Ponce, P. R., November 19, 1932 (I No. 3189); all were collected by R. G. Oakley.

Differs from *lateralis* LeConte in being more oblong and more finely, sparsely punctured, and in having the pubescence on the dorsal surface longer and more erect. Name, description and notes by W. S. Fisher.

***Caenocara maculatum* Fisher, new species**

Rotundate, strongly convex, strongly shining, reddish or brownish black, legs paler, each elytron with a large, reddish-yellow, discal spot covering basal two-thirds, pubescence sparse, moderately long, whitish on black area, yellowish on reddish-yellow area, erect above, more recumbent beneath. Eyes nearly divided. Head and pronotum rather densely, finely, uniformly punctate. Elytra finely, irregularly punctate, the punctures more or less arranged in rows on disk. Beneath more densely, coarsely punctate. Length, 1.38 mm; width, 1.38 mm.

Type and one paratype in United States National Museum, collected on *Inga vera* at the Pérez Finca, Ponce, P. R., November 26, 1932, by R. G. Oakley (I No. 3230).

Differs from the other known species of this genus in having a large reddish-yellow spot on each elytron. Name, description and notes by W. S. Fisher.

***Caenocara insulanum* Fisher, new species.**

Rotundate-oval, moderately convex, feebly shining, uniformly reddish brown (palpi and antennae pale yellow), pubescence rather dense, long, wavy, brownish-yellow, suberect above, shorter and sparser beneath. Eyes incised for one-fourth their length. Head and pronotum sparsely, finely, densely punctate. Elytra coarsely, densely punctate basally, the punctures becoming finer and more distant toward apices. Beneath rather densely, coarsely, uniformly punctate. Length, 1.58 mm; width, 1 mm.

Type in United States National Museum, collected on *Rhizophora mangle* at the Guánica Central Finca, Ponce, P. R., September 21, 1933, by R. G. Oakley (I No. 4686).

Differs from *oakleyi* Fisher in being more oblong, more densely punctured and pubescent, and more subopaque. Name, description and notes by W. S. Fisher.

BOSTRYCHIDÆ

***Dinoderus minutus* Fabricius—det. E. A. Schwarz**

Wolcott 24-30: eaten by *Anolis cristatellus*.

Danforth: at Utuado vii-30 det. Mutchler, Algarrobo iii-31, Mayagüez ix-33.

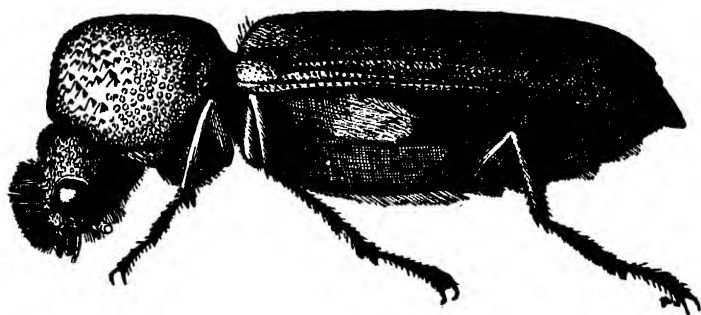
in dry bamboo (120-11); very abundant in flour (140-16); in dead stem of *gandul*, *Cajon cajon*, at Rincón (110-15); in upright dead tree at Vega Alta (170-15); in sweet corn seed (62-33 det. R. T. Cotton).

Rhizopertha dominica F.—det. W. S. Fisher

in chicory beans (I No. 1621); in dry chick peas (I No. 2880-C).

Rhizopertha pusilla Fabricius

Leng & Mutchter 17-207: "Cosmopolitan species or introduced from the United States in timber."



Apate francisca F. Five times natural size.
(Drawn by G. N. Wolcott.)

Apate francisca Fabricius

(as *Apate carmelita* Fabr.) Stahl. Gundlach, "Es dañino a los árboles, perforando la larva, los troncos y ramas".

(as *Apate monachus* Fabr.) Van Z. (24), a borer in branches of pomelo, citron. *Cajan cajan*, chinaberry, *Linociera dominicensis*, *Salix humboldtiana* and coffee.

(as *Bostrychus monachus*) Hooker 13-24; boring in grapefruit, pigeon pea, flamboyant, coffee and citron.

Van Zwaluwenburg 16-44: "very numerous about Mayagüez and during the past year (1915) has been repeatedly found boring in young mahogany trees. The young stages have been found only in dead trees, but the work of the adults so weakens the trees that they are easily broken in a heavy wind."

Van Zwaluwenburg 17-516: "A living coffee tree may have as many as thirteen adults working in its trunk, and still survive, unless broken over by wind." Additional hosts: grapefruit and dry posts of "palo de hueso", *Picramnia pentandra*.

Smyth 19-139: "rarely riddles the standing stalks" of sugar cane.

Wolcott, G. N., "El Caculo Taladrador del Tallo del Cafeto", Circular 48, Estación Experimental Insular, Río Piedras, P. R., pp. 2, fig. 2. San Juan, October 1921.

EEP-55: an economic account.

Seín, F., "Informe sobre el Brote del 'Apate francisca' en Lares". El Agricultor Puertorriqueño, Vol. 11, No. 7, p. 24. San Juan, 1931: recording a destructive outbreak.

Leonard 32-127: the same outbreak; affecting coffee, guava, aguacate, pomarrosa, achiote, pigeon peas, at Lares.

Danforth: at Tallaboa in dead tamarind xi-30 det. Mutchler, at Mayagüez iii-27, iv-27 and many other dates.

boring in pomegranate at Bayamón (281-23); in trunk of small tree of *Inga vera* at San Sebastián (144-32); boring in trunk of small tree of gandul and grapefruit at Isabela (29-33); in tamarind at Tallaboa (I No. 1229); at light at Bayamón (I No. 4139 det. as *Apate monachus* by W. S. Fisher); at light (256-13), at Guánica (688-13); boring in small tree of flamboyán, *Poinciana regia* (244-12 det. E. A. Schwarz); boring in coffee trees at Sabana Grande (323-21); boring in stalk of sugar cane at Limón, (H. Bourne, collector) 30 adults in one stalk (Photographs Nos. 497 & 500).

Tetrapriocera tridens Fabricius

Leng & Mutchler.

(as *Xylopertha longicornis* Oliv.) Gundlach.

Wolecott 24-30: eaten by *Anolis cristatellus* at Boquerón.

Danforth: at Coamo Springs xi-30 det. Mutchler.

at light at Guánica, July to October, most abundant in early October (589-13 det. E. A. Schwarz).

Heterarthron gonager Fabricius

Leng & Mutchler 14-453: from Mona Island.

from algarroba, *Prosopis juliflora*, at Guánica (548-13, 689-13 det. W. S. Fisher).

Zylomeira torquata Fabricius

(as *Xylomeira*) Leng & Mutchler.

Danforth: in dead tamarind at Tallaboa xi-30 det. Mutchler.

larvae abundant in dead branch of leguminous tree at Coamo (133-23 det. W. S. Fisher).

LYCTIDÆ

Lyctoxolon japonicum Reitter—det. E. A. Schwarz

Danforth: at Aibonito.

at light in great numbers, breeding in native clothes basket (17-21), parasitized by Pteromalid wasps, probably *Neocatalaccus* sp. det. S. A. Rohwer; in branch of leguminous tree at Coamo (134-23).

CISIDÆ

Lyctus (Trogoxylon) aequalis Wollaston —det. W. S. Fisher

at light (I No. 4722).

Lyctus curtulus Casey—det. W. S. Fisher

breeding in basket (I No. 3441, 4870).

Cis sp.—det. W. S. Fisher

in dead tree at Ponce (I No. 5500).

Ennearthron delicatulum Jacq. Duval

Gundlach.

SCARABAEIDÆ

- Chapin, E. A.,** "New Species of Scarabaeidae (Coleoptera) from Puerto Rico and the Virgin Islands." Jour. Agr. Univ. P. R., Vol. 19, No. 2 (April, 1935) pp. 67-71. San Juan, Oct. 15, 1935.

Dr. E. A. Chapin made all determinations in this family for Dr. Danforth and in the collection of the College of Agriculture (AMC), as well as of the specimens intercepted by inspectors of the Federal Plant Quarantine, and has critically re-examined every specimen in the collection of the Insular Experiment Station.

- Canthonella parva** Chapin, E. A., "**Canthonella**, a New Genus of Scarabaeidae (Coleoptera)." Amer. Mus. Novitates No. 409, pp. 2. New York, March 18, 1930: TYPE from Coamo Springs, others from Adjuntas, P. R., "almost blue-black, the pale spot on the elytron----humeral, and the pronotum----strongly, densely and moderately coarsely punctate. Length 3 mm."

in dung at Adjuntas (I No. 5080 PARATYPE); at Ponce (I No. 5114); in orange fruit at Yauco (I No. 5490).

- Canthochilum andyi** Chapin 35-68: TYPE from Matrullas Dam, near Orocovis, P. R.
under dung at Matrullas (I No. 5847).

- Canthochilum hispidum** Chapin 35-67: TYPE from Villalba, P. R.

- Canthochilum histeroides** Harold

Chapin 34-101: collected by R. G. Oakley at Pietri finca, Adjuntas and at Wersching finca, Ponce, all in or under dung.

- Canthochilum oakleyi** Chapin E. A., "A New Genus and Species of Dung-Inhabiting Scarabaeidae from Puerto Rico, with Notes on the Coprinae in the Greater Antilles (Coleoptera)". Proc. Biological Soc. Wash., Vol. 47, pp. 99-101. Washington, D. C., June 13, 1934: TYPE from Adjuntas, P. R.

under dung at Adjuntas (I No. 3881 TYPE, 5115.—B,—C), at Aibonito (I No. 5790), at Yauco (I No. 5755, 5789, 5791).

- Aphodius granarius** Linnaeus

Merrill 15-54: in fresh cow manure.

(as sp.) Stevenson 15-20: attacked by Green Muscardine, *Metarrhizium anisopliae*.

Wolcott 24-17: eaten by *Anolis pulchellus*.

- Aphodius guadeloupensis** Fleutiaux

Danforth: at Ceiba xii-29, La Tortuguera iii-27, Mayagüez, v-29, ix-28, etc.

AMC: also at Algarrobo iii-31, Humacao xi-30, Ponce xii-30, Villalba vi-30, etc.

in dung at Villalba (I No. 5684).

Aphodius lividus Olivier

Merrill 15-54: in fresh cow dung.

Wetmore 16-61: eaten by Ani.

Danforth: at Ceiba xii-28, Mayagüez viii-28, Caomo ii-32.

AMC: at Luquillo viii-32, Algarrobo iii-31 and many others.

EEP-164: in fresh cow dung.

in filter-press cake or cachaza (40-12); in cow dung at Guánica (470-13, 538-13); (I No. 2507); in feed store-room at Ponce (I No. 2565); at light at Bayamón (I No. 3345).

Ataenius cognatus Leconte

Danforth: at Mayagüez v-29, Cartagena Lagoon i-29, Coamo ii-29, San Germán xii-30, Ceiba xii-28.

AMC: also at Ponce xii-31, Yauco ii-30, Cabo Rojo vi-31.

at light at Bayamón (I No. 3179).

Ataenius exaratus Chevrolat

Danforth: San Germán xi-30, Mayagüez v-29, xi-31.

Ataenius gracilis Melsheimer

Leng & Mutchler.

Wetmore 16-22, 66: eaten by Green Heron and Tody.

AMC: at Utuado viii-30, Cabo Rojo xi-31, Ponce iii-31, many dates at Mayagüez.

Danforth: at San Germán xi-30, Mayagüez v-29, ii-31.

at light at Bayamón (I No. 3343), at Ponce (I No. 4337).

Ataenius imbricatus Melsheimer

Leng & Mutchler 17-208.

Ataenius marginatus Fabricius—det. E. A. Schwarz

at light at Pt. Cangrejos (April, 1920, GNW); in cow dung at Arecibo (311-22), at Guánica (471-13).

Ataenius rhyticephalus Chevrolat

(as *Auperia*) Gundlach.

Ataenius stercorator Fabricius

(as *Auperia*) Gundlach.

Merrill 15-54: in fresh cow manure.

Leng & Mutchler 17-208.

Wetmore 16-39, 61, 69, 91, 98: eaten by Killdeer, Ani, Owl, Mockingbird and Vireo.

Wolcott 22d-18: "during the periods of least rainfall on the south side the beetles *Aphodius lividus* Oliv. and *Ataenius stercorator* Fabr. become very abundant and by feeding on and tunneling through the fresh manure change it to a dusty, felty mass of undigested fibers."

EEP-164: in fresh cow manure.

Wolcott 24-30: eaten by *Anolis cristatellus*.

Danforth 26-120: eaten by Adelaide's Warbler.

Van Volkenberg, H. L., "Report of the Parasitologist". in P. R. (Mayagüez) Agr. Expt. Station Report 1930, pp. 38-40. Washington, D. C., 1931: host of a tapeworm eysticeroid.

Dexter 32-5: eaten by Surinam toad, *Bufo marinus*.

Danforth: at Mayagüez iv-29, v-29, xii-28, Las Marías iv-29, Ceiba xii-28, Cartagena Lagoon iii-27.

AMC: also at San Germán iv-31, Cabo Rojo xii-31, Maricao i-31, Humacao xi-30, x-30, and many other records.

at Ponce (I No. 5200), on ground at Jayuya (I No. 3618); under *Cosmopolites sordidus* banana corm traps (155-23); in decaying cane seed (751-14), at Loíza (25-11), at Fajardo (231-12), at Aguirre around roots of cane growing in "poyal" land (590-12 det. Schwarz); in old straw (36-12), in filter-press cake or cachaza (39-12, 3-21); under bark of rotten tree at Bayamón (511-17); in cow dung (602-12). at Arecibo (310-22), at Guánica (539-13, 472-13, 555-13); at light at Pt. Cangrejos (GNW), at Guánica (611-13).

Ataenius terminalis Chevrolat

Leng & Mutchler.

(as sp.) Wetmore 16-63, 66: eaten by Woodpecker and Tody.

Danforth (& AMC): at Coamo iii-29, ix-29, San Germán xi-30, Mayagüez ix-28, v-32, ix-30, xi-30.

Ataenius sp. nov. Chapin

at light at Bayamón (I No. 3053).

Psammobius gracilis Jacq. Duval

Chevrolat, L. A. A. Coleopteres de l'Isle de Cuba". Ann. Sec. Ent. France, ser. 4, Vol. 4, p. 414. Paris, 1864: TYPE from Cuba, P. R. and Guadeloupe.

(as *Psammodius*) Stahl. Gundlach, "Viene por las noches a las velas de las casas".

Trox suberosus Fabricius

(as *T. crenatus* Oliv.) Stahl. Gundlach.

Dexter 32-6: eaten by Surinam toad, *Bufo marinus*.

Danforth: at Mayagüez xi-27, Río Piedras x-29, etc.

attacking sugar cane, according to Mr. C. T. Murphy, at Guánica (398-12 det. E. A. Schwarz as *Trox punctatus* Germar); under dead rat (802-14); at light (I No. 5716), at Pt. Cangrejos (GNW), at Humacao (57-13), at Guánica (573-13); at Isabela (119-31).

Phyllophaga (Lachnosterna) vandinei Smyth, E. G., 17-68; TYPE from Guánica, P. R. "armatures of theca of male genitalia bicuspidate at tip; spicula sharply deflexed; ---habitat is restricted to the western end (of the Island of Porto Rico), its farthest east recorded occurrence being at Manatí on the north coast and at Peñuelas on the south". Larvae feed on roots of plants, especially sugar cane, adults on leaves of

- sugar cane and many trees (see Smyth 17-79). Length of egg stage 14 days, 1st. instar larva 36 days, 2nd. instar larva 47 days, 3rd. instar larva 183 days, pupa 21 days; total life-cycle approximately one year, but with two periods of maximum abundance of adults, late April and late August (at Guánica), and a very few present from September to March.
- Cotton, R. T. "Experimental Work on the Control of the White Grubs of Porto Rico." Jour. Dept. Agr. P. R., Vol. 2, No. 1, pp 1-18, January 1918: unsuccessful attempts at control.
- Cotton, R. T. "Medios para Comatir los Gusanos Blancos." Circ. No. 12 Insular Experiment Station, Río Piedras, pp. 3-7, 1918, fig. 1 and 2: the practical methods of control.
- Moser, J., "Neue Arten der Gattung *Lachnosterna* Hope und *Phytalus* Er. (Col.)." Stettiner Ent. Zeitung, Vol. 79, pp. 19-76. Stettin, 1918: *Lachnosterna portoricensis* (Chevrolat i. l.) Long. 21 mm., TYPE from "Portorico", pp. 62-63.
- Stevenson 18-22: attacked by *Melarrhizium anisopliae*: "the Green Muscardine will not serve as a practical means of controlling the white-grubs or May beetles in Porto Rico."
- Barrow, E. H., "White Grubs, *Lachnosterna* sp., and Larvae of the Weevil Root-Borer, *Diaprepes spengleri* L., attacking Sugar Cane in the Guánica District of Porto Rico, and Methods practised for Controlling Them." Jour. Dept. Agr. P. R., Vol. 8, No. 2, (April, 1924), pp. 22-26. San Juan, November 1924: over 3,000,000 grubs collected in 1919 and over 2,000,000 beetles in 1922.
- IP-101 to 103: redescription by J. D. More.
- Box 25-301: "the writer believes that its larval parasites, as well as the parasites of the adult and the predaceous enemies, are the same as those of *L. portoricensis*."
- Danforth 26-23, 30, 126: abundant near Cartagena Lagoon, eaten by Least Grebe, W. I. Killdeer, and grubs by P. R. Thrush.
- U. S. Department of Agriculture, Federal Horticultural Board, Hawaiian and Porto Rican Quarantine covering Sand, Soil or Earth, with Plants. Notice of Quarantine No. 60, p. 1. Washington, D. C., February 19, 1926: To prevent the spread of *Lachnosterna*-----.
- May 27-5: eaten by Surinam toad, *Bufo marinus*.
- Dexter 32-4: "*Phyllophaga* and *Diaprepes* constituted 41% of the food of the toads."
- Sein 30-178: type of feeding of the grubs.
- EEP-24 to 27: an economic account.
- EEWI-128 and 484: an economic summary, as pest of sugar-cane; beetles strip banana plants of leaves.
- Wolcott 33-268: solution of the white grub problem by the introduction and subsequent abundance and spread of the Surinam toad, *Bufo marinus*.

Wolcott, G. N., "The White Grub Problem in Puerto Rico." Fifth Congress, International Soc. Sugar-Cane Technologists, pp., fig. 4. Brisbane, Queensland.

1936: on extended account, noting on the soft membranous lobes of the genitalia of the male, four large dark spiny crescents and eight small ones.

Danforth: at Mayagüez, many dates.

at light at Isabela, March 10th (104-32) and August 11th (115-31 Leonard 33-126) the first records for spring and fall; at Manatí (845-12, 226-12), Barceloneta (226A-16), Garrochales (241 & 242-16), Arceibo (145-16, 225-16), San Sebastián (436-13), Añasco (373-12, 1018-13), Hormigueros (817-15), Guánica (TYPE locality) and Yauco (very many records); at Mayagüez (144-23, 534-23), on leaves of *Terminalia catappa* (532-23), of *Andira jamaicensis* (531-23); in ground at base of coffee tree at Utuado (219-23).

Phyllophaga (Lachnosterna) portoricensis Smyth, E. G., 17-145; TYPE from Río Piedras, Porto Rico: "The eastern analogue *P. vandinei* --- its distribution --- approximately the eastern two-thirds of the Island." Has the same feeding habits as *P. vandinei* and one year cycle. "Armatures (of theca of male) spatulate at tip; spicula roundly deflexed."

(as *Ancyloncha crenaticollis* Blanchard) Stahl.

Wetmore 16-11: the "múcaro" or Bare Legged Owl, *Gymnasio n. nudipes* is the most important bird feeding on the adults, as they constituted 24.4% of its stomach contents, the Mozambique, *Holoquistulus brachypterus*, feeds on the grubs (1.61% of the stomach contents) and the Little Blue Heron on adults (1% of stomach contents).

Stevenson 18-22: attacked by Green Muscardine, *Metarrhizium anisopliae*.

1P-103: re-description by J. D. More.

EEP-24 to 27: an economic account.

Wolcott 24-51 to 53: experiments in control with paradichlorobenzene. "It must be thoroly mixed with the top layer of soil if applied as crystals, or evenly distributed if as a liquid, to be completely effective. It can not be safely applied in a stool of cane to kill the grubs feeding there, and it will not penetrate the soil laterally to kill the grubs if applied in the furrow. At 17 cents per pound, in ton lots, the quantity required to destroy all the white grubs in an acre, 800 pounds, would cost \$136 f.o.b. the factory in the States."

Wolcott 24-53: "One larva (of the "cucubano", *Pyrophorus luminous* Illiger) which transformed to adult killed and ate eight first-instar white grubs, fifteen second-instar grubs, forty-two third-instar grubs and three pupae of *Lachnosterna portoricensis* Smyth." (the same data in Est. Expt. Insular Circ. No. 80.)

Wolcott 24-1011: grubs fed to *Ameiva c. exul* in experiments, and eaten by this lizard in nature.

Wolcott 24-88 to 91: experiments in control with carbon bisulfid emulsion in water, most efficient in moist soil, cost of the material \$25 per acre.

Box 25-300: "the writer has been able to demonstrate that the third-instar grubs are the host of the Scoliid wasp *Dielis* (*Campsomeris*) *trifasciata* F., and are also liable to attack by *D. dorsata* F. and *D. pyrura* Roh. The second-instar grubs have been found to serve as host for another Scoliid, *Elis xanthonotus* Roh., (and) it is not improbable that *L. portoricensis* is the host of *Elis ephippium* F."

Dozier 26-115: 75% control of grubs with carbon bisulfid emulsion.

May 27-5: eaten by Surinam toad, *Bufo marinus*.

Earle 28-77: mention.

Tower 29-241: grubs attacking Irish potatoes.

EEWI-128 to 131, 484: an economic summary.

Wolcott 32-409: at light the first night after the hurricane of San Ciprián.

Wolcott 36- : illustration of genitalia of male, showing ten large and many small crescents in the soft membranous lobes.

Jepson (in Wolcott 34-437): host of *Elis xanthonotus* Rohwer.

(I No. 938), at Bayamón (I No. 1141, 5333), at Vega Baja (318-23); at light in April with min. temp. 72°F. (6-34), in August (136-32); at candle-light, second floor of house, first night after the hurricane of San Ciprián (150-32); grubs quite abundant despite abundance of toads (35-34); at Fortuna (366-13), Aguirre (515-12, 380-13), Santa Isabel (943-13), Yabucoa (31-74), Humacao (101-15), Fajardo (463-12), Vieques Island (67-17-"somewhat larger and lighter in color"), Luquillo (198-13, 945-13), Mameyes (176-13), Río Piedras (many records-TYPE locality), San Vicente (99-15, 225-15).

Phyllophaga (*Lachnosterna*) *citri* Smyth, E. G., 17-159; TYPE from Río Piedras, Porto Rico, "Adnate armatures fused into a single spatha (which is) cymbiform, chitinous and polished above". One year life cycle, grubs often abundant in sandy land of north coast, feeding on roots of citrus trees, adults feed on leaves of citrus, rose, *Psidium guajava*, *Grevillea robusta*, *Acalypha wilkesiana*, *Miconia racemosa*, *Clidemia hirta*, *Lantana camara*, *Triumphetta* sp., *Urena lobata*, and others which are eaten by *P. vandinei* and *P. portoricensis*.

Moser 18-61: *Lachnosterna insulicola* n. sp., long 15 mm., TYPE from Portorico.

IP-103: redescription by J. D. More.

Stevenson 18-22: attacked by the Green Muscardine fungus.

EEP-65: in citrus groves.

Wolcott 24-30: beetle eaten by *Anolis cristatellus*.

May 27-6: grub eaten by Surinam toad, *Bufo marinus*.

EEWI-461: an economic account as a pest of citrus.

Leonard 32-125: in citrus groves.

Jepson (in Wolcott 34-438): large grubs as host of *Elis xanthonotus* Rohwer.

(I No. 61), at light at Bayamón (I No. 4195, 5334), at Mayagüez (533-23), at Isabela April 17 (114-31) April 15 (111-32); in ground at the base of coffee trees at Corozal (217-23); at Aguirre (304-15), Aibonito (1304-13), Mameyes (817-12), Vieques Island (68-17), Río Piedras (many records-TYPE locality), Vega Alta (339-17), Barceloneta (227A-16), Garrochales (242-16, 247-16), Arecibo (146-16, 225A-16), Aguadilla (448-13) and Añasco (372-12, 1008-13).

Phyllophaga (Lachnosterna) guanicana Smyth, E. G. 17-152; TYPE from Guánica, Porto Rico, "Adnate armatures fused into a single spatha (which is) fleshy, surmounted by minute prostrate spinules; spicula dextral; female genitalia without pubic process": adults from February to July, with maximum abundance of beetles in late April, feeding on leaves of *Lantana camara*, *Cordia cylindrostachya*, *Bucida buceras*, *Psidium guajava* and *Hamelia* sp., grubs feed on grass roots in upland pastures.

IP-104: re-description by J. D. More.

Box 25-301: quoting Smyth.

Stevenson 18-22: attacked by the Green Muscardine fungus. at Guánica and Yauco (TYPE localities 426 to 437-15): no specimens have since been collected by anyone, despite special search by Dr. Danforth and students.

Phyllophaga crinitissima More IP-105: TYPE a single male collected at light at Pt. Cangrejos, P. R., Feb. 2, 1916 by G. N. Wolcott.

on beans at Arecibo (I No. 2936 det. ? A. G. Böving); grubs at Arecibo (I No. 3050 det. ? A. G. Böving) Specimens have also been collected by W. A. Hoffman at light at Puerta de Tierra (San Juan), P. R.

Phyllophaga discalis Chapin 35-70: TYPE from the mountains north of Yauco, others from Añasco, P. R.

Danforth: at Añasco x-31.

Phyllophaga yunqueana Chapin 35-70: TYPE from El Yunque, P. R.

Phytalus apicalis Blanchard—det. F. S. Arrow

(as *Phytalus insularis* Smyth E. G., 17-163: TYPE from Guánica, P. R.): on *Amaranthus* spp. and *Panicum barbinode*, life-history notes.

(as *P. insularis* Smyth) Stevenson 18-22: attacked by the Green Muscardine fungus.

(as *P. insularis* Smyth) Wolcott 22d-14: third instar larvae as host of *Elis haemorrhoidalis* F.

Wolcott 25-53: grubs weigh from three to six times as much as the wasps of *Elis haemorrhoidalis* parasitic upon them.

Box 25-334: in restricted localities, as many as two-thirds of the grubs may be attacked by *Elis haemorrhoidalis*. Control by collecting the female wasps in such places and transporting them to others where unparasitized grubs are numerous: the record of a field experiment.

Earle 28-177: mention.

EEWI-127: adults feed on leaves of Snow-on-the-Mountain, grubs parasitized by *Elis haemorrhoidalis*.

Danforth: at Luquillo vi-32, Coamo Springs ix-29, Toa Baja xii-32.

at light (183-15, 643-16, 113-12, 20-18, 943-16, 5-21, I No. 3167, 4852, 5887), at Aibonito (922-15), at Isabela, March 25 (107-32), April 15 (110-32), April 19 (113-31)—first records in the spring; at Garrochales on *Lantana involucrata* (241B-16); at Guánica (many collections by Smyth); adult at roots of pepper plant at Ponce (I No. 3419); at Pt. Canegrejos, feeding on leaves of *Phyllanthus nirous* Bull., var. *roscopectus*, Snow-on-the-Mountain (GNW); grub at Arecibo (I No. 3050 det. A. G. Böving).

Parachalepus (Dyscinetus) barbatus F. = sanguinicollis L.

(as *Chalcopus*) Stahl. Gundlach.

Van Z. (316) on sugar cane.

Smyth 16-47: life-history summary.

Stevenson 18-22: attacked by the Green Muscardine fungus.

Leonard 32-140 and 33-126: at light at Isabela (GNW).

Wolcott 32-409: at light the first night after the hurricane of San Ciprián.

EEWI-126: one of the smaller "black hard-back" beetles: "their elytra are smooth, their legs less spiny, and they lack the roughened area on the abdomen by means of which *Ligyris* beetles are able to make known their objection to being held between the fingers."

Danforth: at Ciales xi-27, etc.

AMC: at Florida vi-31, Carolina iv-31, Luquillo vii-32, Lares vii-31, Cabo Rojo x-31, Rincón ix-32, Barranquitas -32, many dates at Mayagüez.

common at light on north side of the Island (77-11 det. as *Dyscinetus barbatus* F. by E. A. Schwarz, 198-11, 610-12, 279-13, 459-13, 63-19, I No. 4386), at Bayamón (I No. 1142, 5335, 5336), at Caguas (SSC), at Ciales (653-21), at Añasco (509-13), at Isabela (117-31) first record of adults at light for the spring is April 18th & 19th, by May 6th and 7th forming the vast majority of all large insects coming to light, but by May 17th, noticeably scarce, a few noted June 8th; rare at Guánica (1056-13, 332-15); fourteen pellets of toad excrement collected on the lawn by the library of the

Insular Experiment Station, Río Piedras, P. R., on May 9, 1935 contained thirty-six *Dyscinetus* beetles, mostly *barbatus* (GNW). Larvae feed on decaying vegetation in the soil.

Dyscinetus picipes Burmeister, Hermann C. C., (as *Chalcopus*) "Handbuch der Entomologie". Vol. 5, p. 79. Berlin, 1847:

TYPE from Portorico.

(as *Chalcopus*) Gundlach.

(also as *D. trachypygus* Burm., not in synonymy) Leng & Mutchler 17-208.

(as *D. trachypygus*) Van Z. (316) on roots of malojillo. *Panicum barbinode*.

(as *D. trachypygus*) Smyth 16-47: life history summary.

(as *D. trachypygus*) Smyth 19-120: adults feeding on the roots of sugar-cane at Carolina (quoted, EEWI-126).

(as *D. trachypygus*) 1P-106:

Danforth 31-41: eaten by Little Blue Heron.

Danforth: at Fajardo ii-27, Mayagüez on many dates.

Chapin, E. A. "Revision of the Pleurostict Scarabaeidae of Cuba and the Isle of Pines. I. The Melolonthidae." Ann. Ent. Soc. Amer., Vol. 25, No. 1, pp. 173-314, pl. 3. Columbus, March 1932: synonymy and re-description, mention of occurrence in P. R.

the elytra of *barbatus* are almost impunctate, those of *picipes* are distinctly striate and punctate, common at light (611-12 det. E. A. Schwarz as *D. trachypygus*, 746-14, 64-19, 435A-19, 368-22), at Bayamón (I No. 4248), at Carolina (708-17), at Maneyes (202-13), at Humacao (60-13), at Barceloneta (465-13), at Arecibo (95-13, 148-16), at Guánica (506-13, 1055-13, 1685-13, 221-15), at Aibonito (I No. 3118); at Adjuntas (I No. 5869); at San Juan (I No. 937).

Ligyris tumulosus Burmeister

(as *Ligyris fossulatus* Latr. det. Chevrolat) Gundlach.

Leng & Mutchler. Van Z. (318) on roots of sugar cane.

Smyth 16-47: life history summary.

	Larva					
	Egg	1st instar	2d instar	3d instar	Pupa	Total
<i>Dyscinetus barbatus</i> -----	13 days	19 days	28 days	59 days	15 days	144 days
<i>Dyscinetus trachypygus</i> --	12 days	22 days	15 days	44 days	13 days	104 days
<i>Ligyris tumulosus</i> -----	13 days	13 days	15 days	27 days	14 days	77 days

The grubs usually feed on decaying vegetation in sandy soil, especially cane stalks. but injury to live roots is accidental.

The adults sometimes bore into the base of live cane stalks.

Wolcott 21-43: "1% of 50,000 stalks of cane examined" thus injured, at Vega Baja, Barceloneta, Camuy, Yabucoa, Humacao and Guayanilla.

Stevenson 18-22: attacked by the Green Muscardine fungus.

Wolcott 25-53: grubs weigh six or seven times as much as do the wasps of *Campsomeris dorsata* F. parasitic upon them.

Box 25-304: "Rough Black Hardback", life-history notes, parasitized by *Dielis (Campsomeris) dorsata* F., which "succeeds in periodically reducing the numbers of *Ligyris* grubs in each locality to almost the zero point".

Leonard 32-140 & 33-126: at light at Aguirre and Isabela (GNW).

Dexter 32-5: eaten by Surinam toad, *Bufo marinus*.

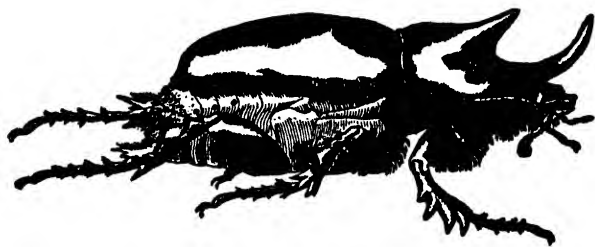
EEWI-194: rarity of injury to cane by adults.

Wolcott 34-438: scarcity of the parasite *Campsomeris dorsata* at Guánica apparently due to scarcity of host caused by the Surinam toad, *Bufo marinus*: the parasite found in abundance only at Puerta de Tierra (San Juan) where the toad can not exist in abundance, and where horse and mule manure is available for the larval stage of *Ligyris*.

Danforth: at Coamo xii-27, x-27, Mayagüez many dates.

AMC: at Cabo Rojo iii-28. Ponce i-31, ix-30, Juncos i-32, Cayey xi-29, and many dates at Mayagüez.

(I No. 61. 2104) at light (3-13, 271-13, 3-19, at Bayamón (I No. 4140), at San Juan (35-11), at Manatí (174-16), at Guánica (46-10, 21-13, 776-13); in soil around cane seedlings (484-12 det. E. A. Schwarz, 743-12), in plowed land at Mayeyes 818-12); around corn at Ponce (I No. 3136); larvae parasitized by *Campsomeris dorsata* Fabr., at Guánica, H. Bourne collector (491-13).



Male of *Strataegus quadrifoveatus* P. B. Natural size.

(Drawn by F. Maximilien.)

Strataegus quadrifoveatus Palisot de Beauvois The Coconut Rhinoceros Beetle.

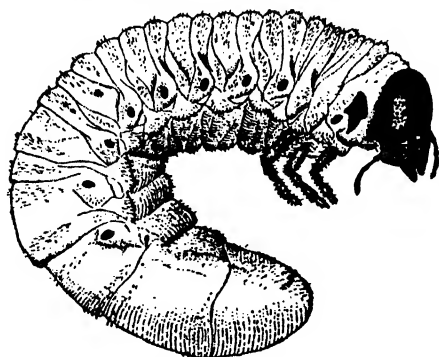
(as *S. laevipennis* Chevrolat) Stahl. Gundlach, "acaso nombre manuscrito."

Leng & Mutchler. AMNH at Mayagüez.

Smyth 19-123: adults boring into stalks of sugar cane and young coconut palms.

Smyth, E. G., "The White Grubs Injuring Sugar Cane in Porto Rico, II, the Rhinoceros Beetles". Jour. Dept. Agr. P. R., Vol. 1, No. 2, April, 1920 pp. 1-31, pl. 4: an extended account of this and the following species.

- Wolcott, G. N., & Scín, F., "Los Caculos Cornudos o los Escarabajos Rhinocerontes de Puerto Rico". Circ. 58, Estación Experimental Insular, Río Piedras, P. R., pp. 13, pl. 4. San Juan, 1922: a summary in Spanish of the paper by Smyth. EEP-76 to 78: an illustrated, economic account.
- Crespo, M. A., "Un Insecto Muy Dañino a las Palmitas del Coco. El Escarabajo Rinoceronte (*Strategus quadriveatus*).". Rev. Agr. P. R., Vol. 4, No. 3, pp. 47-48. San Juan, 1920.
- González Ríos, Policarpo, "El Cultivo del Cocotero en Puerto Rico". Circ. No. 35. Estación Experimental Insular, Río Piedras, P. R., pp. 20, fig. 4. San Juan, 1921: an economic account.
- Catoni, L. A., "Plagas de Insectos que atacan la Palma de Coco". Rev. Agr., Vol. 7. No. 3, pp. 21-25. San Juan, 1921. Leonard 31-116: "The Extension Division has been conducting a clean-up campaign against this pest which has been more injurious since the hurricane of 1928 than formerly."
- Leonard 32-127: over \$3,000 spent in clean-up campaign. EEWI-373 to 377: an economic, illustrated summary.
- Leonard 33-126: adults attacking cane at Utuado.
- Danforth: many records at Mayagüez.
- AMC: at Yauco ii-31, xii-33, Utuado vii-30, Luquillo vii-29, many dates at Mayagüez.



Larva of *Strataegus quadriveatus* P. B.
Natural size. (Drawn by F.
Maximilien.)

at light (133-11, 213-13, 104-15, 307-16, 868-16), at Bayamón (I No. 5255), at Aibonito (I No. 4537), at Ponce (I No. 4539), at Aguirre (5-12). at Adjuntas (FS & GNW); injuring young coconut palm trees by burrowing into them below the soil (285-22); at Sabana Llana (108-18, 99A-18, 16-18, 401-19, 184-21), at Loíza Viejo (192-21), at Manatí (136-16) males attacking fish-tail palm (39-25); burrowing

up into cane stalk (108-18, 520-19); larvae in rotten wood at Aibonito (I No. 3444), at Adjuntas (I No. 5087); from soil around cane at Guánica (2-10); in filter-press cake or cachaza (14-21); in interior of rotten coconut palm at Loíza Viejo (259-16), at Pueblo Viejo (163-32).

Strataegus barbigerus Chapin, E. A., "Entomology.—*Strataegus simsoni* L. and related West Indian species (Coleoptera: Scarabacidae)." Jour. Washington Academy Sciences, Vol. 22, No. 15, pp. 449-456, fig. 10. Washington, D. C., September 19, 1932: TYPE from Aguirre, others from many other places in P. R. and St. Croix and St. John Islands.

(as *Scarabocus tytanus*) Ledru 1780.

(as *Strataegus titanus* F.) the name used in publications previous to Chapin 32-455: The Sugar-Cane Rhinoceros Beetle.

Gundlach. Leng & Mutchler.

AMNH at Martín Peña and Fajardo.

Van Dine 13-41: grubs eating cane roots at Guánica, Ponce, Fortuna, Santa Isabel and Aguirre on south coast.

Stevenson 18-22: attacked by the Green Muscardine fungus. EEP-27 to 32: an illustrated, economic account.

Dexter 32-4: eaten by Surinam toad, *Bufo marinus*.

EEWI-59: "toads are large enough to eat the females of the smaller rhinoceros beetle, and at times succeed in keeping one down until her struggles cease."

EEWI-123 to 125: an economic summary.

at light (336-13, 449-13, 468-13, 123-15, 182-15), at Isabela (112-32), at Ponce (I No. 4536, 4538), at Bayamón (I No. 4856), at Aguirre (116-11 TYPE); in rotten tree at Dorado (713-13); larvae at base of rotten fence-post (323-13); larvae from soil around cane roots, sometimes attacking live roots at Guánica (4-10), at Santa Isabel (85-11, 848-14), at Fortuna (929-13), on Vieques Island (69-17); larvae attacking seed cane at Guánica (GNW); larva in rotten wood at Aibonito (I No. 3135, 3444).

Grubs feed on rotten wood and roots and stumps of trees in the soil, old cane stalks and decaying cane seed, but attack live roots only when other sources of organic matter are lacking; the food of the adults "consists largely of the green parts of woody plants and young trees" (Smyth). One year life-cycle.

Epiphileurus puertoricensis Chapin 35-69: TYPE from Villalba, others from Barranquitas, P. R.

Danforth: at Barranquitas xii-30.

in decaying palm at Villalba (I No. 5677 TYPE).

Phileurus didymus Linnaeus—det. E. A. Schwarz

in termite nest, *Nasutitermes morio* Latr., at Ciales (242B-16, 467-21); at Mayagüez (813), R. H. Zwaluwenburg, collector.

Phileurus valgus L.

Danforth: at Ponce ix-30.

in rotten wood at Adjuntas (I No. 3625).

Homophileurus quadrituberculatus Palisot de Beauvois

(as *Phileurus*) Gundlach, "La larva vivió en el nido o bulto de *Termes morio*".

Kolbe, H. J., "Ueber die Phileurinen Amerikas". Ann. Soc. Ent. Belgique, Vol. 54, p. 341. Brussels, 1910: listed from P. R.

Leng & Mutchler.

LUCANIDÆ

Paxillus (Passalus) pentaphyllus Palisot de Beauvois

Ledru 1780. Stahl.

(several unlabeled specimens).

Paxillus (Passalus) crenatus MacLeay

in rotten wood at Adjuntas (I No. 3621).

Spasalus puncticollis Serville

(as *Passalus dentatus* Fabr.) Ledru 1780.

(as *Passalus* sp.) Gundlach.

Leng & Mutchler.

Danforth: at Añasco iv-29 det. Mutchler, Villalba-Ciales Road, alt. 2,000 ft., xi-29.

larvae and adults in rotten log at Yauco (308-21); at Mayagüez (617). R. H. Van Zwaluwenburg collector.

CERAMBYCIDÆ

Fisher, W. S.,

"New West Indian Cerambycidae (Coleoptera) Sub-family Lamiinae." Amer. Mus. Novitates No. 174, pp. 16. New York, May 28, 1925.

Fisher, W. S.,

"Notes on the Rhinotraginae Beetles of the Family Cerambycidae, with Descriptions of New Species." Proc. U. S. Nat. Mus., Vol. 77, Art. 19, No. 2842, pp. 20. Washington, D. C., 1930.

Fisher, W. S.,

"New West Indian Cerambycid Beetles." Proc. U. S. Nat. Museum No. 2922, Vol. 80, Art. 22, pp. 93. Washington, D. C., 1932.

Fisher, W. S.,

"New Cerambycid Beetles from Puerto Rico." Jour. Agr. Univ. P. R., Vol. 19, No. 2 (April, 1935), pp. 51-63. San Juan, October 15, 1935.

All recent determinations in this family have been made by Mr. W. S. Fisher.

Parandra cribrata Thomson

Leng & Mutchler.

on weeds, at Vilalba (I No. 5731).

Parandra cubaecola Chevrolat

Leng & Mutchler.

(as sp.) Wetmore 16-69: eaten by Owl.

Stenodontes bituberculatus Palisot de Beauvois

Danforth: Mayagüez x-27, Añasco iii-27.

in burrow of live guácima tree, *Guazuma guazuma*, at Salinas (76-16); unlabeled specimens probably from Guánica—
det. W. S. Fisher.

Stenodontes damicornis Linnaeus

Stahl.

Stenodontes exsertus Olivier

Leng & Mutchler. Van Z. (P. R. 806).

at light at Ceiba (I No. 4174).

Stenedontes mandibularis Fabricius

Stahl. Gundlach.

Nothopleurus maxillosus Drury

(as *Mallodon*) Gundlach. Stahl.

Leng & Mutchler 17-209: recorded by Gundlach.

Callomegas protelarius Lameere, A., Ann. Soc. Belgique, Vol. 48,
p. 66. Brussels, 1907: TYPE from P. R.

Leng & Mutchler.

resting on stump at Lares (332-21 det. E. A. Schwarz).

Callomegas sericeus Olivier

(as *Orthomegas*) Stahl. Gundlach.

Leng & Mutchler.

Derancistrus (Solenoptera) thomae Linnaeus = **Solenoptera lateralis**
Chevrolat

(as *S. lateralis* Chev.) Stahl. (as *Prosternodes*) Gundlach.

Leng & Mutchler. AMNH at Aibonito. Van Z. (P. R. 20).

(as sp.) Wetmore 16-77: eaten by Kingbird.

Danforth 31-71: eaten by P. R. Lizard Cuckoo.

Danforth: at Mayagüez on many dates.

AMC: at Coamo Springs vi-30, Utuado viii-30, Maricao vi-32, Adjuntas xii-31, Añasco x-30, Lares v-31, Luquillo viii-31, Aguadilla xii-32, San Sebastián vii-30, San Germán xii-33, v-33, Yauco iv-33.

(145-11, 796-14); on unidentified bush at Fajardo (181-16); on coffee trees or stumps in mountains north of Yauco (240-22); adult and many larvae, mostly small, but many half-grown, in small fence-posts, just under the bark, at Yauco 300-September, 1921); larva in rotten twig of achote, *Bixa*

orellana, at Lares, June 14, pupated July 20, adult Aug. 3, dead September 12 (230-21); on *Inga vera* at Adjuntas (I No. 2662); active adult on dead branch of *Inga laurina* at Maricao (GNW).

Derancistrus (Solenoptera) bilineata F.

Danforth: at Utuado viii-30 det. Fisher.

Britonella chardoni Fisher 32-8: TYPE from Mayagüez, P. R. at Ponce (I No. 4848).

Pseudoeme poolei Fisher
at light (I No. 4422).

Plectromerus distinctus Cameron (TYPE from Haiti) det. W. S. Fisher
at Ponce (I No. 4611), at Yauco (I No. 5805).

Methia punctata Leconte
Stahl. Gundlach.

Methia necydalea Fabricius
Leng & Mutchler.
Danforth: at Luquillo vii-32 det. Fisher, at Mayagüez x-29 det. Mutchler, viii-30.

Chlorida festiva Linnaeus

Stahl. Gundlach. Leng & Mutchler.
Van Z. (1213), larvae bore in branches of mango.

Wetmore 16-61: eaten by Ani, *Crotophaga ani*.

Danforth: at Adjuntas xi-28, at Mayagüez many dates, etc.

AMC: on El Yunque iv-29, Luquillo viii-32, Carolina iii-31, Humacao xi-30, Aguas Buenas xii-32, Toa Baja xii-32, Algarrobo iii-31, Caguas ii-28, Coamo vii-30, Barranquitas xii-30, Flordia vi-31, Ponce xii-32, Yauco xi-31, xii-32, Cabo Rojo i-30, Aguadilla xii-32, and Mayagüez on many dates.

common at light (190-11, 556-12 det. Schwarz, 566-12, 620-12, 486-13, 1086-16, 146-17), at Bayamón (I No. 4134), at Lares (415-22), at Añasco (509½-13), at Guánica (552-13), usually with Uropodid mite nymphs on the thorax; resting on post (2-32); larvae tunneling in cóbana logs at Naguabo (7-26).

Eburia bindosa Gahan, C. J., "On the Longicorn Coleoptera of the West India Islands". Trans. Ent. Soc. London, pp. 79-140, pl. 2. London, 1895: TYPE from P. R.—possibly a synonym for *E. quadrimaculata* L.

Eburia portoricensis Fisher 32-15: TYPE from Guayama, P. R.

Eburia quadrimaculata Linnaeus

Leng & Mutchler.

(as sp.) Wetmore 16-58, 66, 82, 96, 98, 104, 114: eaten by Cuckoo, Tody, Flycatcher, Vieros, Adelaide's Warbler and Yellow-Shouldered Blackbird.

Danforth: at Mayagüez v-30, v-28, etc.

AMC: at Humacao iii-33, Luquillo vii-33, San Germán xii-33, Ponce ix-30, many records at Mayagüez.

at Condado (80-11 det. Schwarz), several unlabeled specimens; (I No. 892); at light at Bayamón (I No. 4040); on *Dioscorea* at Ponce (I No. 4533).

***Elaphidion glabratum* F. ?**

Danforth: at Utuado xii-32 det. Fisher.

***Elaphidion insulare* Newman**

at Ponce (I No. 4970, 5130), at Mayagüez (I No. 5832).

***Elaphidion irroratum* Linnaeus**

(as *E. bidens* Oliv.) Stahl. Gundlach, "no lo creo igual *E. irroratum* L."

Leng & Mutchler 17-209: recorded by Gundlach.

Danforth: at Cartagena Lagoon v-30 det. Mutchler, Coamo Springs iv-30, iii-29, ix-30.

at light (479-16). at San Juan (32-14 det. Schwarz), at Guánica (1094-13, 188-15).

***Elaphidion nanum* F.**

(as *Elaphidion cinereum* Olivier) Gundlach.

Leng & Mutchler 17-209: recorded by Gundlach.

Danforth: on Vieques Id. i-29, at Coamo iii-29, xi-29, many dates at Mayagüez.

AMC: fifteen records; at Yauco ii-30, Lares i-30, Luquillo vi-32, etc.

at light at Humacao (59-13), at Vega Baja (478-16), on Vieques Island (GNW). (Specimens from Haina, Santo Domingo determined by Dr. Schwarz as *E. cinereum* Oliv., by Mr. Fisher as *E. nanum* Fabr.) (I No. 2973).

***Elaphidion portoricensis* Fisher 32-15: TYPE from Coamo Springs, others from Yauco, P. R., "each elytron with three white pubescent spots".**

at Yauco (88-22 PARATYPE), at Ponce (I No. 4534).

***Elaphidion spinicorne* Drury**

(? as *Hypermallus spinicornis* Oliv.) Stahl.

Gundlach. Leng & Mutchler.

at light at Guánica (687-13 det. Schwarz), at Humacao (661-17), at Lares (114-22).

***Elaphidion thomae* Gahan**

Danforth: at San Germán xii-32.

at light at Bayamón (I No. 5260).

***Elaphidion tomentosum* Chevrolat**

Leng & Mutchler 17-209.

at Palo Seco (113-15), at Cayey (25-21 det. Schwarz), at Maricao (387-21); larva in wood of cupey tree (350-33).

Heterachthe 4-maculatus Fabricius—det. E. A. Schwarz

Danforth: at Ponce v-30, Utuado xii-32.

at light at Guánica (1076-13), at Lares (148-22), at Pt. Cangrejos (GNW—det. Fisher); on flamboyant flowers at Ponce (I No. 4484).

Stizocera vanzwaluwenburgi Fisher 32-46: TYPE from Mayagüez, others from San Germán and Coamo, P. R.

Danforth: at Añasco x-30, Mayagüez xii-30, Coamo Springs iv 31, Algarrobo iii-31.

Tilloclytus minutus Fisher 32-62: TYPE from Tallaboa, P. R., "bluish-black, coarsely alveolate-punctate".

Tilloclytus portoricensis Fisher 35-51: TYPE from Guánica, P. R. "basal part of pronotum and basal halves of elytra reddish". at Guánica (I No. 5854 TYPE).

Lamproclytus elegans Fisher 32-68: TYPE from Bayamón, P. R., "Elongate, strongly shining, black, except basal third of each elytron, brownish yellow, each elytron ornamented with transverse eburneous fascia".

Lamproclytus oakleyi Fisher 35-52: TYPE from Ponce, P. R., "uniformly dark reddish brown". on *Tabebuia* at Ponce (I No. 4693 TYPE).

Ecyrus flavus Fisher 32-81: TYPE from Mayagüez, P. R., "Elongate, robust, strongly convex above, uniformly pale reddish brown, rather densely clothed with short whitish and yellowish pubescence".

Linsley 35-89 to 90: listed from P. R.

Ecyrus nanus Fisher 32-79: TYPE from Boquerón, others from Mayagüez, P. R., "short, robust, strongly convex, uniformly reddish brown, densely clothed with whitish, brownish and yellowish pubescence".

Linsley, E. G., "A Revision of the Pogocherini of North America". Ann. Ent. Soc. Amer., Vol. 28, pp. 73-104. Columbus, 1935: listed on p. 90 from P. R.

Merostenus attenuatus Chevrolat
(as *Lampromerus*) Gundlach.

Leng & Mutchler 17-209: recorded by Gundlach.
in flowers of *Scirpus validus* at Ponce (I No. 4510).

Compsa sp.

Wetmore 16-69, 82: eaten by Owl and Flycatcher.

Cylindera flava Fabricius

(as *Lampromerus pilicornis* Fabr.) Stahl. Gundlach.

Leng & Mutchler 17-209.

Dexter 32-5: eaten by Surinam toad, *Bufo marinus*.

Danforth: at Toa Baja xii-32 det. Fisher, Coamo Springs v-29, Algarrobo x-30.

at light (91-23), at Condado (66-10 det. Schwarz), at Bayamón (I No. 2985, 5243, 5256), at Humacao (662-19), at Guánica (591-13); on lima bean blossoms at Loíza (I No. 1672 Leonard 33-132).

Acyphoderes aurulenta Kirby—det. G. E. Bryant

(as *Odontocera abdominalis* Olivier) Stahl. Gundlach.

(as *A. abdominalis* Olivier) Leng & Mutchler.

Fisher 30-12: synonymy, from Mayagüez and Cayey, P. R.

Danforth: at Coamo vi-30, Río Piedras xii-30, xi-30. Mayagüez iii-28.

on leaves of *Psidium guajava* at Cayey (211-23); at Adjuntas (I No. 4643); on mango blossoms at Mayagüez (I No. 3819); at Bayamón (I No. 5532).

Euryscelis suturalis Olivier—det. W. S. Fisher

(I No. 5883); at light at Aguirre (68-16); on *Prosopis juliflora* logs at Guayama (49-25).

Neoclytus araeniformis Olivier

Stahl. Gundlach. Leng & Mutchler.

Danforth: at Maricao xii-30, Las Marías v-31, Añasco x-30, Coamo Springs v-29.

ovipositing in freshly-cut logs of *Inga vera* in the mountains north of Yauco (319-September 8, 1921—det. E. A. Schwarz); reared from dead wood at Yauco (I No. 5482).

Proecha spinipennis Chevrolat—det. E. A. Schwarz

(197-11, 905-14), at Pt. Cangrejos (GNW).

Cyrtinus eugeniae Fisher 35-60: TYPE from Aibonito, P. R.

on pomarrosa at Aibonito (I No. 4768 TYPE).

Cyrtinus oakleyi Fisher 35-62: TYPE from Yauco, P. R.

in decaying plants at Yauco (I No. 5625 TYPE).

Cyrtinus subopacus Fisher 35-61: TYPE from Adjuntas, P. R.,

"allied to *eugeniae* Fisher, but it differs from that species in being larger and subopaque, and in having the punctures on the elytra elongate".

at Adjuntas (I No. 3984 TYPE).

Monochamus titillator Fabricius

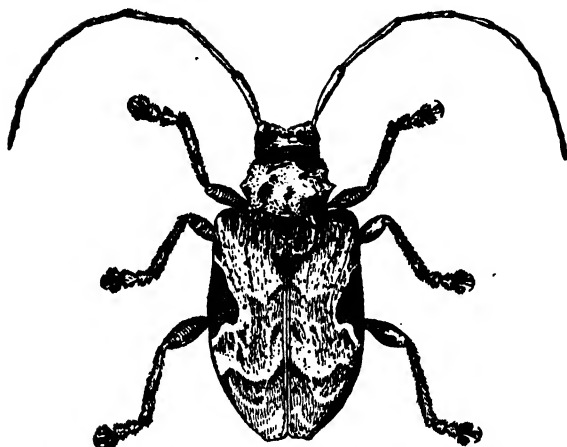
(as *Monohammus*) Gundlach.

Lagochirus araneiformis Linnaeus

Stahl. Gundlach. Van Z. (P. R. 805).

Danforth: at Utuado viii-30, Coamo Springs ix-29, Peñuelas i-29, Mayagüez many dates.

at light (296-12, 401-17), at Coamo (I No. 4540); at Bayamón (I No. 4039), at Condado (36-11 det. by Dr. Schwarz as *L. obsoletus* Thomson, 84-24), at Yabucoa (64-13).



Lagochirus araneiformis L. Twice natural size.
(Drawn by F. Maximilien.)

Leptostylus albosignatus Fisher 35-53: TYPE from Ponce, P. R., "allied to *antillarum* Fisher, but differs from that species in having a distinct, large, white, pubescent spot on the elytra". on dead wood at Ponce (I No. 5850 TYPE), at light at Bayamón (I No. 4855).

Leptostylus antillarum Fisher 25-5: TYPE from Culebra Island, others from cacao at Mayagüez, P. R. at light at Bayamón (I No. 2984, 5129); on dead wood at Yauco (I No. 5769); larvae under bark of stump at Dorado (898-13); larvae and pupa in rotten fence post at Maricao (414-21).

Leptostylus argentatus Jacq. Duval

Danforth: at Mayagüez ii-27 det. Fisher, i-29, Isabela vi-32. AMC: at Cabo Rojo i-30, x-31, Maricao xii-30, Barranquitas xii-30, Yauco ii-31, xii-33, Río Piedras ix-31, Mayagüez on many dates.

Leptostylus gundlachi Fisher 25-2: TYPE from Aibonito, P. R. in pod of beans from *Erythrina* tree (67-24).

Leptostylus longicornis Fisher, W. S., "Descriptions of New West Indian Longicorn Beetles of the Subfamily Lamiinae". Proc. U. S. Nat. Museum, Vol. 68, Art. 22, No. 2623, pp. 15-16. Washington, D. C., 1926: TYPE from P. R. on dead wood at Adjuntas (I No. 5608); at light at Mayagüez (32-22); resting on tree of *Inga vera* at Lares (230-22); on firewood at Lares (128-21); in tunnels in a log at Naguabo (51-25).

Leptostylus nigricans Fisher 35-55: TYPE from Villalba, P. R.
at Villalba (I No. 5666 TYPE).

Leptostylus oakleyi Fisher 35-54: TYPE from Bayamón, P. R.,
"allied to *gundlachi* Fisher, but it differs from that species in
the different arrangement of the brown pubescence on the
elytra, and in having a broad, dark brown, pubescent vitta on
each side of the pronotum."
at light (322-22, 148-23), at Bayamón (I No. 5257 TYPE).

Leptostylus portoricensis Fisher 35-56: TYPE from Adjuntas, P. R.
at Adjuntas (I No. 4304 TYPE).

Leptostylus sagittatus Jacq. Duval

Gundlach. Long & Mutchler.

(as sp.) Wetmore 16-59, 63, 66, 69, 82, 96, 98, 99, 104, 106, 108,
111: eaten by Cuckoo, Woodpecker, Tody, Owl, Flycatcher,
Vireos, Redstart, Warblers and Honey Creeper.

Wolecott 24-30: eaten by *Anolis cristatellus*.

at light at Bayamón (I No. 5257); on grapefruit at Dorado
(I No. 4178); at Adjuntas (I No. 4304), at Villalba (I No.
5666),

Eugamandus brunneus Fisher 35-58: TYPE from Yauco, P. R.,
"having the tubercles on each elytron arranged in two longi-
tudinal rows".

in vegetable debris, amountains north of Yauco (I No. 5654
TYPE).

Eugamandus flavipes Fisher 35-59: TYPE from Villalba, P. R.,
"each elytron with only two distinct tubercles".
in vegetable debris at Villalba (I No. 5667 TYPE).

Eugamandus oakleyi Fisher 35-57: TYPE from Matrullas Dam,
near Orocovis, P. R., "allied to *schwarzi* Fisher, but differs
from that species in being more strongly convex, and in having
the elytra distinctly tuberculate".

in decaying wood at Matrullas Dam (I No. 5861 TYPE).

Lepturges guadeloupensis Fleutiaux & Sallé.

Wetmore 16-66: each by Tody, *Todus mexicanus*.

Wolecott 24-30: eaten by *Anolis cristatellus*.

Danforth: at Mayagüez xi-30 det. Fisher.

at Vega Alta (GNW); reared from pods of aroma, *Acacia
farnesiana* at Boquerón (150-23); in coffee grove at Ciales
(220-22), on cotton at Guayanilla (559-21); adult burrow-
ing in Hibiscus twig at Mayagüez (I No. 3960); on orange
at Ponce (I No. 4319, 4364); on *Inga vera* at Villalba (I No.
4371); on dead wood at Ponce (I No. 5850 det. as "sp.").

Oreodera lateralis Olivier

Gundlach. Long & Mutchler.

Probatius umbraticus Jacq. Duval

Gundlach. Long & Mutchler.
on mocha at Ponce (I No. 4535).

Spalacopsis flum Klug

Gundlach. Long & Mutchler.
Danforth: at Luquillo vii-32 det. Fisher.
in coffee grove at San Sebastián (101-21 det. E. A. Schwarz);
on *Malpighia* flowers at Aibonito (I No. 4767 det. as "near").

Ataxia alboscuteolata Fisher

Danforth: at Utuado xii-32 det. Fisher.
at light at Bayamón (I No. 4135); on dead wood at Guánica (I No. 5804); on pomarrosa at Ponce (I No. 4700),

CHRYSOMELIDÆ

Suffrian, C. G. L. E. "Zur Kenntniss der Nordamerikanischen Cryptoccephalen." *Linnea Entomologica*, Vols. 6, pp. 282-283 and 7, pp. 85 to 203. 1852.

Weise, J. "Beitrag zur Chrysomeliden—und Coccinelliden—Fauna Portorico's." *Archiv für Naturgeschichte* Vol. 51, No. 1, pp. 144-168, pl. 8. 1885.

Unless otherwise indicated, identifications of specimens recorded in this family under Interception Numbers (I No.) are by Mr. H. S. Barber.

Lema confusa Chevrolat

Stahl.

Lema dorsalis Olivier

Gundlach. Leng & Mutchler. AMNH at Aibonito and Coamo.
Danforth: at Manatí iv-29 det. Mutchler. Mayagüez vi-28, ii-29, etc.

AMC: over twenty records.

elytra purplish-blue with diagonal and transverse broad band of yellow: (I No. 894); swept from grass (63-12 det. E. A. Schwarz, 80-12). at Caguas (RTC), at Boquerón (14-23), at Arecibo (I No. 2417 Leonard 33-134); on carrots at Utuado (I No. 3728).

Lema nigripes Weise, J., 85-144: TYPE from P. R.

Gundlach. Leng & Mutchler.

(as sp.) Wetmore 16-61, 66. 84. 108, 111: eaten by Ani. Tody, Wood Pewee, Black and White Warbler and Honey Creeper.

Wolcott 24-30: eaten by *Anolis cristatellus*.

Danforth 26-1, 20: eaten by Adelaide's Warbler.

Danforth: at Manatí iv-29 det. Mutchler, Salinas iii-29, Cartagena Lagoon iii-27, Cidra ii-32.

AMC: twenty records.

antennae and eyes, as well as legs, black; body orange-yellow, elytra dark blue: swept from grass (62-12), at Cayey (125-16), at Caguas (RTC—det. E. A. Schwarz), at Aibonito (SSC), at Ciales (222-22); on cocozelle squash (I No. 3518); from *Crotalaria* flowers at Arecibo (I No. 3626); on *Commelina* at Bayamón (I No. 5414).

Lema poeyi Lacordaire
Stahl.

Lema polita Lacordaire, J. T., "Monographie des Coleopteres Subpentamerus de la Famille des Phytophages Vol. 1". Mem. Soc. Roy. Sci. Liege. Vol. 3, pp. 355-356. 1845: TYPE from P. R. (as *Lema placida* Lacordaire) Stahl.

Leng & Mutchler.

elytra blue, elsewhere black, one specimen (390-12 det. E. A. Schwarz); at Bayamón (I No. 3277).

Exema sp.

on flowers of pomarrosa at Aibonito (I No. 4378, 4380).

Chlamys straminea Suffrian ?

(as sp.) Wetmore 16-108: eaten by Northern Parula Warbler. on *Dioscorea* at Ponce (I No. 4489, 4966); on *Ocotea* at Ponce (I No. 4512); on flowers of pomarrosa at Aibonito (I No. 5611).

Pachybrachys mendicus Weise, J., 85-183: TYPE from P. R. Gundlach. Leng & Mutchler.

Danforth: on *Acacia* at Tallaboa iv-31 det. Mutchler, Guánica vi-34.

on *Randia mitis* at Ponce (I No. 4496).

Pachybrachys praetextatus Suffrian 52(7)-203: TYPE from P. R. Leng & Mutchler.

Pachybrachys sp. nov. Barber

on mangrove at Ponce (I No. 4683), at Guánica (I No. 5701).

Cryptocephalus krugii Weise, J., 85-148: TYPE from P. R. Gundlach. Leng & Mutchler.

Danforth 31-87: eaten by Jamaican Vireo.

Danforth: at Yauco x-26 det. Mutchler, iii-29, Mayagüez xii-30, Ponce viii-34.

Cryptocephalus tristiculus Weise 85-147: TYPE from P. R. Gundlach. Leng & Mutchler.

IP-112: in synonymy with *C. nigrocinctus*, based on lack of correlation, in a long series of specimens examined, in the smoothness or punctation of the thorax, the pale mark on the

central portion of the basal segment of the abdomen and general color of blue-green (mostly females) to dull purplish-brown (mostly males); also on the interpretation of these characters as indicated by specimens determined by Dr. E. A. Schwarz and Mr. G. E. Bryant.

Danforth 26-90: eaten by Ani.

Danforth 31-90, 92: eaten by Northern Parula Warbler and Black-Throated Blue Warbler.

on *Carissa* at Garrochales (411-16 det. E. A. Schwarz); on *Inga vera* (80-21 det. E. A. Schwarz); on flower of *Inga laurina* al Yauco (I No. 4049), on mango flowers at Mayagüez (I No. 3818, 3690, 5167); on *Ficus* at Ponce (I No. 4610); on cotton at Arecibo (I No. 836); on orange at Arecibo (I No. 1919), at Adjuntas (I No. 5209); on cassava at Lares (I No. 2343); on almendra at Arecibo (I No. 2396); on flowers of *Bidens pilosa* at Cidra (I No. 2905); on pepper at Ponce (I No. 3027).

Cryptocephalus nigrocinctus Suffrian 52(6)-282: TYPE from P. R. Gundlach. Leng & Mutchler.

Wolcott 24-15, 20, 26, 30: eaten by *Anolis evermanni*, *A. pulchellus*, *A. stratulus* and *A. cristatellus*.

Leonard 33-125: on rose.

Danforth: at Mayagüez ii-27, Quebradillas iv-29, Joyuda xi-30, Maricao iii-29, Utuado viii-30, Adjuntas vi-34, Aibonito vi-34, La Tortuguera iii-27, etc.

AMC: over fifty records, about half from Mayagüez.

on grapefruit (283-16), at Vega Baja (535-16 det. E. A. Schwarz), at Mayagüez (121-23 R. C. Danforth collector); on sedge (476-16), on mangrove (250-23), on *Inga vera* at Mayagüez (260-23); on *Inga laurina* at Lares (154-22); on icaco, *Chrysobalanus icaco*, at Pt. Salinas (51-23); on weeds at Comerío (757-13); on castor bean at Luquillo (97-16); on *Dalbergia Ecastophyllum* at Humacao (288-23), at Algarrobo (195-22 det. G. E. Bryant); on tobacco at Cayey (36-16); on *Carrisa* at Vega Alta (111-17); at Aibonito on roses (107-15); on *Psidium guajava* at Juncos (155-16), at San Sebastián (116-32); on Humboldt's willow at Florida (53-21); on unidentified tree at Lares (265-22), at Guayama (I No. 3120); on cotton at Algarrobo (195-22), at Quebradillas (220-21); at Aibonito (SSC); on sugar cane at Barceloneta (GNW); on *Cordia borinquensis* at Camuy (21-24); on *Stigmaphyllon* at Ciales (35-24), at San Sebastián (116-32); on sea-grape at Humacao Playa (288-23); on rose (4-32); on fresas at Cayey (209-23); on Eucalyptus at Mayagüez (260-23).

Cryptocephalus spp. (probably mostly *C. nigrocinctus* Suffrian)

Wetmore 16-66 to 125: eaten by Tody, Kingbird, Petchary, Flycatcher, Wood Pewee, Swallow, Martin, Vireos, Redstart, five Warblers and Oriole.

Wolcott 24-11: eaten by *Ameiva exsul*.

Cryptocephalus perspicax Weise, J., 85-151: TYPE from P. R.

Gundlach. Leng & Mutchler.

Wolecott 24-26, 34: eaten by *Anolis stratulus* and *A. gundlachi*.

Wolecott 26-50: on sea-grape.

Danforth: at Mayagüez v-30 det. Mutchler, v-32, vi-32.

bright yellow; prothorax and elytra light brown in color with large yellow spots: feeding on leaves of sea-grape, *Coccoloba uvifera*, at Quebradillas (309-22 det. E. A. Schwarz). brown or piceous; prothorax and elytra darker: feeding on leaves of *Inga vera* (79-23), of *Inga laurina* at Ponce (I No. 4523, 4524); at Mayagüez (261-23), at Aibonito (I No. 355), at Comerio (755-13); abundant, feeding on tender leaves of *Dalbergia Ecastophyllum* at Pt. Salinas (125-23); on *Myrcia* sp. at Ciales (36-24); on moca at Mameyes, (59-24); on *Solanum torvum* (14-33); at Aibonito (I No. 4872, 4873).

Cryptocephalus polygrammus Suffrian

Gundlach. Leng & Mutchler.

Cryptocephalus multiguttatus Suffrian

Danforth: at Faro de Cabo Rojo iv-29 det. Barber.

Cryptocephalus stolidus Weise, J., 85-49: TYPE from P. R.

Gundlach. Leng & Mutchler.

Danforth: at Aibonito vi-34, Guánica vi-34.

on *Ficus* at Ponce (I No. 4520, 4521, 4522, 4612).

Cryptocephalus tortuosus Suffrian

Gundlach. Leng & Mutchler.

Cryptocephalus viridipennis Suffrian

Leng & Muthler 17-210.

Cryptocephalus spp. nov. Barber

at Adjuntas (I No. 4311); on chinaberry at Adjuntas (I No. 4781); at Villalba (I No. 5686); on pomarrosa at Guánica (I No. 5699, 5763).

Diachus nothus Weise, J., (as **Cryptocephalus**) 85-152: TYPE from P. R.

(as *Cryptocephalus*) Gundlach, "No en Cuba, donde vive *C. pusio* Suffrian, que es muy parecido".

Leng & Mutchler.

(as *C. pusio*) Wetmore 16-66, 84, 87, 108, 111: eaten by Tody, Elainea, Cliff Swallow, Parula Warbler and Honey Creeper.

in grapefruit grove at Vega Baja (536-16 det. E. A. Schwarz); on tender growth of *Inga laurina* at Lares (168-22); possibly another species with more coarsely punctate elytra and lighter yellow in color, on *Inga vera* (81-21); on *Stigmaphyllon lingulatum* at Camuy (20-24); on *Wedelia* and swamp vegetation at Bayamón (174-23).

"The samples now before me arrange themselves on color and size as follow:

Elytra blue, body orange, female with abdomen orange, male abdomen orange at base and apex, the intermediate sternite infusate; size larger.----*nothus* Ws. I No. 3873, 3476, 3486B.

Elytra black, pronotum, head and legs yellow, metasternum and abdomen black, size smaller.----? *nothus* var. I No. 3873, 4376, 4376-B.

Entirely black or piceous, the legs sometimes brownish; size smaller.----? *nothus* var. I No. 4382, 4376-B."

Determined H. S. Barber.

on flowers of pomarrosa at Aibonito (I No. 4376), at Ponce (I No. 4545, 4382). of *Inga vera* or *Inga laurina* at Adjuntas (I No. 3873, 4307).

Triachus cerinus Leconte

Danforth:

on flowers of *Randia mitis* at Ponce (I No. 4492).

Lamprosema longifrons Suffrian

Gundlach. Leng & Mutchler.

Danforth:

on pomarrosa at Ponce (I No. 4513); on ? at Yauco (I No. 3617-B).

Nodonota wolcotti, Bryant, G. E., "New Species of Phytophaga". Annals and Mag. Nat. Hist., Ser. 9, Vol. 13, p. 299. London, March 1924: TYPE from Aguadilla, others from Mameyes, P. R.

Wolcott 24-30: eaten by *Anolis cristatellus*.

Danforth: abundant on *Conocarpus erecta* at Faro de Cabo Rojo iv-29 det. Mutchler, Guánica vi-34.

bronze-black, shining, finely and evenly punctured, each puncture with a short white hair, antennae, tibiae and tarsi brown: on sagebrush, *Croton* spp., at Yauco (47-22), at Boquerón (95-23), at Aguadilla (332-23 TYPE); hiding in Attelabid egg-roll on sea-grape at Mameyes (342-22); on beach at Luquillo (I No. 4910); at Guánica (I No. 5765); on cotton flowers at Ponce (I No. 4050); on *Dioscorea* at Ponce (I No. 4466); on mabí at Mayagüez (I No. 4734).

Colaspis alcyonea Suffrian

Gundlach. Leng & Mutchler.

(as sp. det. E. A. Schwarz) on El Yunque (809-12).

Metachroma antennalis Weise J., 85-155: TYPE from P. R.

Gundlach. Leng & Mutchler.

(as sp.) Wetmore 16-104, 108, 116: eaten by Warblers and Oriole.

Wolcott 24-56: reported as attacking cotton at Quebradillas. Leonard 32-138 & 33-124: serious on roses at Aguirre.

EEWI-275: as a pest of cotton.

Danforth: at Coamo ix-29 det. Mutchler.

reported as attacking cotton at Quebradillas in June (185-22 det. E. A. Schwarz and G. E. Bryant); between leaves and in spider nests on various plants on the beach at Arecibo (165-May 21, 1923), at Hatillo (238-23); on leaves of "palo de muñeca", *Rauwolfia nitida*, near Faro de Agujereada. Aguedilla (121-31); on "húcar" at Ponce (I No. 4752-B).

Metachroma liturata Suffrian

Wetmore 16-116: caten by Oriole.

on "húcar" at Juana Díaz (I No. 4475).

Metachroma wolcottii Bryant

(I No. 2841); on "húcar" at Juana Díaz (I No. 4475).

Metachroma sp. nov. Barber

on guava (I No. 2430, 2513 Leonard 33-117), at Bayamón (I No. 3096, 4404), at Aibonito (I No. 4375), at Villalba (I No. 5663); on "húcar" at Ponce (I No. 4752); on coffee at Adjuntas (I No. 4314); on *Inga vera* at Adjuntas (I No. 4356); on pomarrosa at Ponce (I No. 4500); on *Micropholis curvata* at Matrullas (I No. 5843 as "sp.").

Leucocera laevicollis Weise, J., 85-156: TYPE from P. R.

Gundlach. Leng & Mutchler.

Danforth: at Mayagüez det. Leng.

on dwarf holly, *Malpighia coccigera*, in the woods at (Seboruco) Pt. Cangrejos (376-22 det. Schwarz, Alice Ames, collector); (235-22 Margaret Lord, collector).

Myochrous armatus Baly—det. G. E. Bryant

(as sp.) Wetmore 16-39, 61, 63, 82, 87, 96, 98, 106, 108, 111: eaten by Killdeer, Ani, Woodpecker, Flycatcher, Cliff Swallow, Vireos, Warblers and Honey Creeper.

on swamp vegetation at Boquerón (175-23).

Phaedon sp. nov. Barber

at Km. 22 Yauco-Lares road (I No. 3617).

Asbecesta violacea Allard

Danforth: at Guánica vi-34.

? on *Colubrina colubrina* at Guánica (I No. 5708).

Galerucella obliterata Olivier, A. G., "Entomologie 6". No. 93, p. 635. 1808: TYPE from P. R.

Leng & Mutchler.

Galerucella varicornis Weise, J., 85-157: TYPE from P. R.

Gundlach. Leng & Mutchler.

Danforth: at Joyuda ii-31 det. Mutchler, Lajas xii-32, Villalba vi-34, Río Piedras ix-31, Mayagüez v-32.

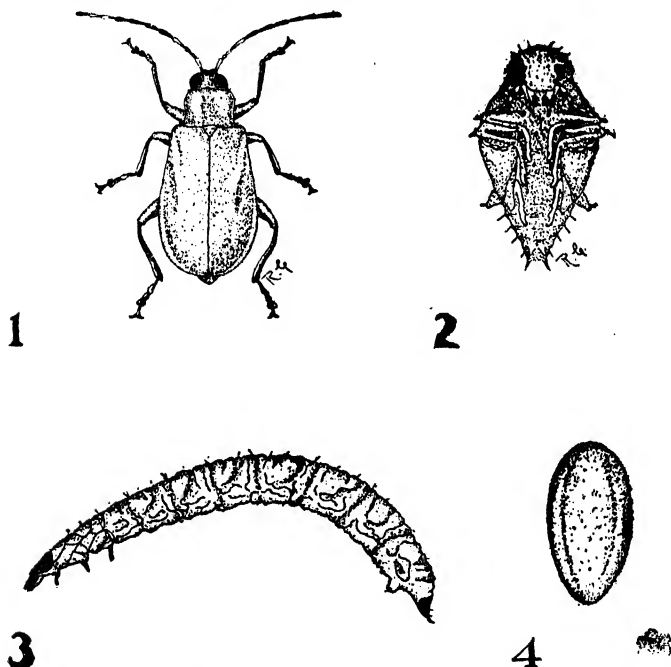
feeding on leaves of "moral", *Cordia sulcata* at Mayagüez (253-23 det. E. A. Schwarz), at Ponce (I No. 4959), at Villalba (I No. 4794).

Galerucella wolcottii Bryant, G. E., "New Species of Phytophaga (Colceopt.)." *Annals and Mag. Nat. Hist.*, Vol. 14, Ser. 9, pp. 247-252. London, August 1924: TYPE from San Juan and Carolina, P. R.

on flowers of *Cordia corymbosa* at Carolina, near the lagoon (112-15 TYPE); on *Gouania polygama* at Arecibo (I No. 2582).

Diabrotica aeruginea Fabricius
Leng & Mutchler.

Diabrotica annulata Suffrian—det. H. S. Barber
on squash at Barceloneta (I No. 3659); on wild cucumber at Villalba (I No. 4368, 4368-B, 4368-C).



Diabrotica graminea Baly: 1, adult, 2, pupa, 3, fully-grown larva, all about five times natural size; 4, egg, very greatly enlarged, with detail of sculpturing below.
(Drawn by R. T. Cotton.)

Diabrotica graminea Baly, J. S., "Descriptions of Uncharacterized Species of Diabrotica" in *Trans. Ent. Soc. London*, Pt. IV, p. 443. London, December 1886: TYPE from P. R.

Leng & Mutchler.

Hooker 13-34: "abundant on South side".

Leng & Mutchler 17-211: from Vieques Island.

- Van Z. (31) on beans, squash, sugar cane and *Erythrina glauca*.
 Van Dine 13-34: on leaves of sugar cane.
 Smyth 19-124: "adults feed to some extent on the foliage, and larvae upon the roots" of sugar cane.
 Wolcott 21-45: sometimes abundant in cane fields.
 Jones 15-5: "very common---on leaves of sugar cane,---injury most severe on corn and okra,---on flowers of cowpeas,---foliage of *Spondias lutea* and *Amaranthus spinosus*."
 Cotton 16-96 to 98, fig. 3: life-history and control, hosts and technical description and illustrations of all stages.
 Cotton 18-302: "attacks almost all vegetable crops, --- very abundant on okra, feeding on the petals, pollen and pistil of the flowers."
 Wetmore 16-61, 66, 80, 128: eaten by Ani, Tody. Petchary and Grasshopper Sparrow.
 EEP-120: on cucurbits, "campana" and okra.
 Leonard 31-117, 32-122, 143 & 33-114, 119, 123: on okra, potatoes, string beans, mung beans and eggplant.
 EEWI-628: adults abundant in flowers of Angel's Trumpet, *Datura suaveolens*.
 Danforth: at Manatí iv-29, Ciales xi-27, Jayuya xi-27, Aibonito vi-34, etc.
 a light green beetle: at Jayuya (I No. 2825); on pepper at Vega Baja (I No. 619, 621); on potato at Cidra (I No. 642, 1355); on peas at Manatí (I No. 1047); on pigeon peas at Añasco (I No. 1085); on euindeamor at Arecibo (I No. 3095); on eggplant at Manatí (I No. 569, 611), at Bayamón (I No. 592, 602); on *Crotalaria* at Cidra (I No. 1293); on lima bean at Barceloneta (I No. 3162); on squash at Vega Alta (I No. 1646); on corn at Aguadilla (130-31); at light at Guánica (588-13); on young leaves of sugar cane at Naguabo (32-10 det. E. A. Schwarz), on Vieques Island (GNW), at Humacao (55-13), at Yabucoa (401-12), at Juncos (8A-19), at Caguas in great abundance (GNW), at Toa Baja (141-13), at Vega Alta (81-13), at Arecibo (188-11, 12-15), at San Sebastián (GNW), at Yauco (240-21); on eggplant (44-16), on pistils of eggplant (53-16), on tomatoes (RTC), on corn (638-17); on corn, cane and especially on beans at Aguadilla (24-22); on orange leaves at San Vicente (709-13); on fruit of *Solanum nigrum* at Luquillo (195-13); at Aibonito (SSC).

***Diabrotica bivittata* Fabricius**

- Stahl. Gundlach. (as *D. pallipes* Oliv.) Leng & Mutchler.
 Hooker 13-34: mention.
 Van Z. (903a) on beans and cucurbits.
 Jones 15-5: "in abundance on cucumber, squash, and melon, especially on the flowers."
 Cotton 18-295: notes.
 EEP-120: on cucurbits..
 May 27-6: eaten by Surinam toad, *Bufo marinus*.

Tower 24-13: control with Bordeaux and arsenate of lead spray.
EEWI-626: on cucurbits.

Danforth: Juncos xii-29, Villalba ix-27, etc.

"smaller than *D. innuba*, legs entirely testaceous, elytral apices not dentate" Dr. E. A. Schwarz: on leaves of squash and cucumbers (395-12); on Chinese cabbage at Jayuya (I No. 2569); on squash at Manatí (I No. 661), at Barceloneta (I No. 3465), at Vega Baja (I No. 3599); on cucumbers at Caguas (I No. 4861); on pumpkin at Las Marías (I No. 471); on watermelon at Garrochales (I No. 638).

***Diabrotica innuba* Fabricius**

Stahl. Gundlach. Leng & Mutchler. AMNH at Aibonito.

Leng & Mutchler 17-211 from Culebra Island.

Van Z. (903) on beans and squash. Jones 15-5: notes.

Cotton 18-294 to 295: "The beetles lay their small yellow eggs in the soil around the roots of the plants, and the larvae, which are slender, white, worm-like creatures, feed on and tunnel the roots."

EEP-120 & EEWI-626: on cucurbits.

Tower 24-13: control.

"larger than *D. viridula*, legs partly black, elytral apices dentate" Dr. Schwarz: on leaves of squash and cucumbers (22-12, 395-12 det. E. A. Schwarz, 640-17, 642-17), at Caguas (RTC), at Aibonito (SSC): on young leaves of sugar cane at Arecibo (11-15); on pokeweed, *Phytolacca decandra*, in the mountains north of Yauco (241-22); on leaves of cantaloupe at Isabela (123-31 Leonard 33-114); on wild cucumber at Caguas (346-23); on squash at Vega Alta (I No. 1706), at Barceloneta (I No. 3261), at Vega Baja (I No. 3599), at Ciales (I No. 4887); on watermelon at Barceloneta (I No. 1242 Leonard 32-132); on cucumbers at Caguas (I No. 4862).

***Diabrotica impressa* Suffrian**

Stahl. Leng & Mutchler.

***Diabrotica quadriguttata* Olivier**

Gundlach. Leng & Mutchler.

***Diabrotica thoracica* Fabricius**

Stahl.

***Luperus* sp. ? det. H. S. Barber**

on *Caperonia* and *Jussiaea* at Loíza (I No. 4198).

***Luperodes* sp.**

Danforth: at Yabucoa vi-30, Cartagena Lagoon iii-27.

***Blepharida irrorata* Chevrolat**

Gundlach. Leng & Mutchler.

on *Matayba* at Ponce (I No. 5798 as "sp").

Cerotoma ruficornis Olivier (1791: TYPE from Guadeloupe)
(as *C. denticornis* Fabricius 1792: TYPE from Venezuela)
Stahl. Gundlach.

Leng & Mutchler. AMNH at Coamo, Aguadilla and Guayanilla.
(as *C. trifurcata*) Hooker 13-34:

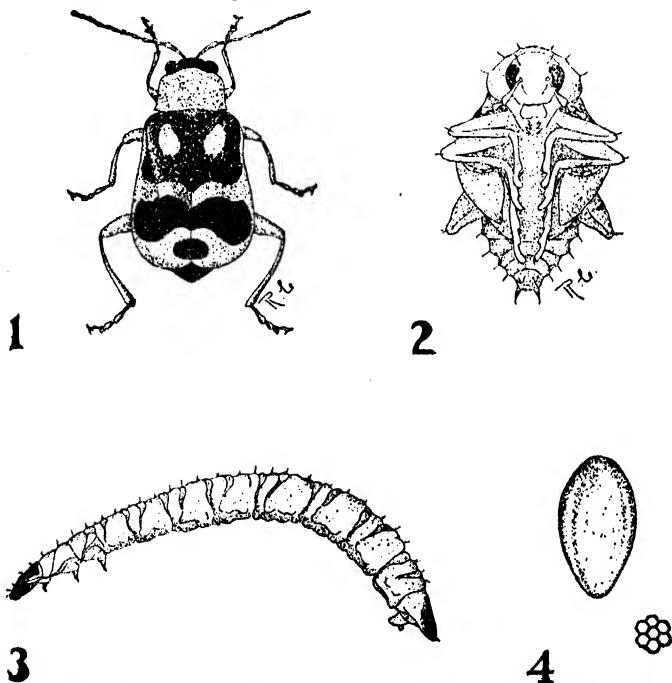
Howard 04-84; Barret 04-448: on beans and cowpeas.

Jones 15-5: "feeding on garden beans and cowpeas."

Van Z. (902) on beans and squash.

Cotton 18-275: notes and control.

Cotton 16-95 to 96, fig. 2: notes, life history and control; illustrations of all stages.



Cerotoma ruficornis Olivier: 1, adult, 2, pupa, 3, larva, all about six times natural size; 4, egg, and detail of sculpturing of egg-shell, greatly enlarged.

(Drawn by R. T. Cotton.)

Wolcott 24-17: eaten by *Anolis pulchellus*.

May 27-6: eaten by Surinam toad, *Bufo marinus*.

EEP-108: on beans.

EEWI-606 to 608: quoting Cotton's account.

Leonard 31-117, 32-122: on string beans.

on beans (I No. 1069); on lima beans (I No. 1755), at Loíza (I No. 1611, 1761); on sweet potatoes at Arecibo (I No. 2492), at Mayagüez (I No. 4741); swept from weeds at

Peñuelas (I No. 3114, 3115); on cucumber at Bayamón (I No. 3273, 3274), at Ponce (I No. 3418); on peppers at Ponce (I No. 3417); on squash at Aguirre (I No. 4958); at Añasco (I No. 4263); on *Glycine hispida* (525-23); abundant on cowpeas and beans (378-12 det. E. A. Schwarz, 71-12, 81-12, 56-16, 138-16, "semi-immaculate adults occur about 1 to 5 of the normal form" 467-16), at Mayagüez (50-23), at Caguas (RTC); on sugar cane at Vega Baja and Guánica (GNW).

Hypolampsis inornata Jacoby—det. G. E. Bryant

on swamp vegetation at Boquerón (186-23); the following as "near": on coffee at Ponce (I No. 3798); in flowers of *Inga laurina* at Adjuntas (I No. 3891, 3892); in betel palm at Adjuntas (I No. 4793), at Villalba (I No. 5658); on pomarrosa at Yauco (I No. 5732, 5796).

Homophoeta albicollis F.—redetermined by Doris Blake

(as *Oedionychis aequinoctialis* F.) Stahl.

(as *H. aequinoctialis* F.) Leng & Mutchler 17-211.

Danforth: at Juncos xii-29, Aguada xi-27, Vega Alta x-27, Mayagüez xii-26 etc.

(I No. 927); abundant on *Heliotropium indicum* (744-12), at Caguas (124-16), at Boquerón (15-23 det. Schwarz as *aequinoctialis*), on Vieques Island (GNW—det. Schwarz); on grapefruit at Vega Baja (511-16): unlabeled specimen det. Mr. C. A. Frost as *aequinoctialis*; at Bayamón (I No. 5544, 3559 as "sp.").

Blepharida ? sp.—det. Barber

on *Matayba* at Ponce (I No. 5798).

Oedionychis bicolor Linnaeus

(as *Altica*) Ledru 1780.

Gundlach. Leng & Mutchler.

Danforth: without locality.

at Ponce (I No. 4468); on unidentified shrub at Laguna San José, Pt. Cangrejos (319-22 det. Schwarz); very abundant on *Volkameria aculeata* at Pt. Salinas (124-March 17, 1923 det. E. A. Schwarz).

Homophoeta (Oedionychis) cyanipennis Fabricius—generic transfer by Doris Blake.

Stahl. Gundlach. Leng & Mutchler.

AMNH at Ponce, Tallaboa and San Juan.

Van Z. (P. R. 33) on young leaves of sugar cane.

Danforth 26-90; eaten by Ani.

Danforth: at Cartagena Lagoon iii-31 det. Mutchler, Ponce x-34, La Plata iii-27, etc.

on *Jussiaea erecta* and *J. suffruticosa*, "also on *Verbesina*, *Valerianoides*, *Pluchea*, *Physalis* and other plants, being gen-

eral feeders" E. G. Smyth (464-16, 505-16), at Pt. Cangrejos (320-22), at Mayagüez (122-23 R. C. Danforth, collector), by the lagoon at Lajas (98-15); on leaves of sugar cane (212-11, 29-12 det. Schwarz), at Cayey and Guánica (GNW); at Ponce (I No. 5852); on *Volkameria aculeata* at Boquerón (94-23); on mangrove leaves at Laguna de San José (248-23).

Oedionychis decemguttata Fabricius

Gundlach. Leng & Mutchler.

Podagrica cyanipennis Weise—det. H. S. Barber

on *Volkameria aculeata* at Ponce (I No. 4469, 4469-B).

Omototus ferrugineus Suffrian

Gundlach. Leng & Mutchler.

on tender growth of *Inga laurina* at Lares (166-22 det. E. A. Schwarz).

Omototus sp. nov. Barber

on pomarrosa at Adjuntas (I No. 3480); at Ponce (I No. 3420); on *Ocotlea* at Ponce (I No. 4544).

Disonycha ambulans Suffrian

Stahl.

Disonycha chlorotica Olivier

Stahl. Gundlach. Leng & Mutchler.

(as *Orygona pallens* F.) Danforth: at Maricao vi-32, Mayagüez xii-32.

at Adjuntas (I No. 2574-B & C as *Orygona pallens* F. ? det. H. S. Barber "a closely related Cuban sp. has been labeled 'D. c. Oliv.' but can hardly be that species"); on sweet potato at Villalba (I No. 2574-E); "or genus unknown near *Haltica*" on *Cacara tuberosa* at Ponce (I No. 2574).

Disonycha pallipes Weise, J., 85-159: TYPE from P. R.

Gundlach. Leng & Mutchler.

Disonycha laevigata Jacoby—det. G. E. Bryant

Wolcott, G. N., "An Important New Pest of Beets in Porto Rico" Jour. Ec. Ent., Vol. 16, No. 5 pp. 459-460. Geneva, N. Y., October 1923.

Danforth, R. E., "Notes on the Life-History of *Disonycha laevigata* Jacoby in Porto Rico". Jour. Ec. Ent., Vol. 17, No. 3, pp. 415-416. Geneva, N. Y., June 1924.

Wolcott 24-30: eaten by *Anolis cristatellus*.

Danforth 26-90: eaten by Ani.

Danforth: at Juncos xii-29, Utuado vi-30, etc.

bright orange-red; eyes, antennae except two basal segments, apical half of tibiae, and all of tarsi, black and finely pubescent; elytra bright green, shining, impunctate: on beets (375-22), on "beets, chard, eggplant and many other vegetables" at Mayagüez (120-23, R. E. Danforth collector); on

Amaranthus at Guánica (242-21); in enormous numbers, resting on cane and beans at Guánica (39-23 det. Bryant); on *Philoxerus vermicularis* at Hatillo (239-23); on beans at Palo Seco (I No. 322 Leonard 32-123); on asparagus at Palo Seco (I No. 451); on corn at Loíza (I No. 2180); on beets at Jayuya (I No. 2567); on cucumbers at Bayamón (I No. 3275); on "maví" at Mayagüez (I No. 4732); on cucumbers at Loíza (I No. 1984); on pepper at Loíza (I No. 1983 Leonard 33-121); on *Solanum indicum* at Mayagüez (I No. 3251); on "jamón con huevo", *Achyranthes baltickiana*, at Loíza (I No. Leonard 33-131); in enormous numbers resting on pineapples at Arceibo (I No. 2583).

Disonycha spilotrachela Blake, Doris, H., "Notes on Some West Indian Chrysomelidae". Bull. Brooklyn Ent. Soc., Vol. 23, No. 2, pp. 93-98. Brooklyn, April 1928: (TYPE from Haiti), others from La Tortuguera, P. R., "small. (5 mm.) yellow brown,--- pronotum 5-7 spotted, elytra with common sutural vitta uniting with narrow submarginal one, a discoidal median vitta on either elytron not reaching apex".
Danforth: at La Tortuguera iii-31 det. Mutchler, at Aguadilla xi-26, Algarrobo x-30.
(I No. 2584 Leonard 33-131).

Agropistes sp. ?—det. H. S. Barber
on *Mayepea domingensis* at Guánica (I No. 5862).

Haltica cubana Bryant, G. E., Ann. and Mag. Nat. Hist., Ser. 9, Vol. 13, p. 302. London, March, 1924: TYPE from Guayama, P. R.
about 3 mm. long, elytra very minutely punctured: millions of adults resting on leaves of tree on hill northeast of Guayama (50-January 23, 1922 TYPE).

Haltica gravidula Suffrian
Gundlach. Leng & Mutchler.

Haltica interstitialis Suffrian
(as *Disonycha*) Gundlach. Leng & Mutchler.
Danforth: at Aguada v-30 det. (without ?) Blake, Guánica vi-34.
at Orocovi (I No. 3091); on *Jasmin* at Bayamón (I No. 5722); on roble (427-12 det. as *Disonycha* by Dr. A .E. Schwarz), at Bayamón (I No. 4698); on *Quercus thompsonii* at Ponce (I No. 3426, 3731).

Haltica jamaicensis Fabricius
(as *Haltica plebeja* Oliv.) Gundlach.
(as sp.) Wetmore 16-39, 66, 87: eaten by Killdeer, Tody and Cliff Swallow.
Leng & Mutchler. AMNH at Aibonito and Coamo.

Cotton, R. T., "Life History of *Haltica jamaicensis* Fabr." Jour. Dept. Agr. P. R., Vol. 1, No. 3, July 1917, pp. 173-175: eggs, larvae and adults on *Jussiaea leptocarpa*, *J. suffruticosa* and *J. erecta*, sometimes adults feed on garden beans. Pupa in ground, .39 days from egg to adult, females lay 500 to 800 eggs.

Danforth 26-119, 122: eaten by Golden Warbler and Northern Water Thrush.

Danforth: at Cartagena Lagoon iii-27, Humacao x-30, Joyuda xi-30, Adjuntas xi-27, Mayagüez ix-28, etc.

on *Jussiaea* (41-12 det. as *H. plebeja* Oliv. by Dr. Schwarz, 153-13, 165-13, 167-13, 168-13), at Manatí (110-16), at Barceloneta (GNW), at Aibonito (SSC); on crape myrtle (76-35); a greenish specimen on mangrove at Laguna de San José (249-23); as "*Altica*": on sea-grape at Guanajibo Dam (I No. 5780); on ñame at Mayagüez (I No. 5837); on *Solanum indicum* at Mayagüez (I No. 3243); at Jayuya (I No. 4095), at Peñuelas (I No. 4374).

***Haltica occidentalis* Suffrian**

Stahl. Gundlach. Leng & Mutchler.

Danforth: at Fajardo xi-29, Lajas v-27, Cartagena Lagoon x-32, Aguada xii-32, Coamo ix-32, Coamo ix-29, Mayagüez ii-27, etc.

at light at Guánica (571-13); on *Jussiaea* (250-12 det. Barber & Schwarz, 42-13, 438-17, 503-16), at Manatí (111-16); on leaves of sugar cane, presence probably accidental, at Toa Baja (142-13), at Guánica, Bayamón and on Vieques Island (GNW); on crape myrtle (57-35); resting on grapefruit at Bayamón (I No. 531); on *Solanum indicum* at Mayagüez (I No. 3245); on Verbena at Loíza (I No. 4349); on melon at Caguas (I No. 5056); at Peñuelas (I No. 4373).

***Altica* near *purpurascens* Suffrian—det. H. S. Barber**

on coffee at Ponce (I No. 4320); on banana at Ponce (I No. 4608); on *Muraya exotica* (I No. 3503).

***Hermaphysa cylindrica* Weise, J., (as *Haltica*) 85-160: TYPE from P. R.**

Leng & Mutchler. (as *Haltica*) Gundlach.

Danforth: at Las Marías i-31, Guánica vi-34.

very abundant on leaves of *Croton humilis*, *C. discolor* and other species of *Croton*, unevenly skeletonizing them, at Ponce (111-13 det. E. A. Schwarz), at Yauco (136-15, 48-22); on *Dioscorea* at Ponce (I No. 4467).

***Lactica scutellaris* Olivier**

Gundlach. Leng & Mutchler.

Danforth: at Adjuntas xi-27 det. Mutchler, Villalba vi-34, Mayagüez xii-32.

swept from weeds (773-13, 475-16, 419-17); on *Trema micrantha* in mountains north of Yauco (321-21 det. R. T. Cotton); at Adjuntas (I No. 3112); on eggplant at Arecibo (I No. 2503).

Lactica sp.—det. E. A. Schwarz

black, legs and antennae brown, about 2 mm. long, on *Caperonia palustris* (579-12).

Crepidodera asphaltina Suffrian

Gundlach. Leng & Mutchler.

Danforth: at Barranquitas xii-30 det. Blake.

on squash at Vega Baja (I No. 3834); on pepper at Loíza (I No. 4199).

Crepidodera hirtipennis

Stahl.

Homophyla krugii Weise, J., 85-163: TYPE from P. R.

Gundlach. Leng & Mutchler.

Danforth: at Matrullas ii-32 det. Blake, Villalba vi-34, Aibonito vi-34.

at Ponce (I No. 4614, 4842).

Aedmon sericellum Clark, Hamlet, "Catalogue of Halticidae in the Collection of the British Museum". p. 131. London, 1860: TYPE from P. R.

Epitrix cucumeris Harris The Black Flea-Beetle of Tobacco of Porto Rico. "La Pulga Negra" of tobacco-growers.

(as *E. fuscata* Jacq. Duval) Gundlach.

(also as *E. fuscata* J. Duval, recorded by Gundlach, not in synonymy) Leng & Mutchler 17-211.

Van Z. (1103) on tobacco leaves.

Jones 15-6: on eggplant, tomato and *Physalis*.

Merrill 16-50: on tobacco, control.

Cotton 16-87: life-history, food-plants and control.

Cotton 18-310: on tomato.

More, J. D., "Las Pulgas del Tabaco" Circ. 50, Insular Experiment Station, Río Piedras, P. R., October, 1921, pp. 1-8, fig. 3.

Wolcott 21-45: one on sugar cane at Aguadilla.

EEP-82: an economic account as a pest of tobacco.

Wolcott 24-17: eaten by *Anolis pulchellus*.

Catoni, L. A., "Plagas de Insectos que atacan la Planta del Tabaco". Rev. Agr. P. R., Vol. 7. No. 5, pp. 45-50. San Juan, 1921.

Torres 29-241: on potatoes.

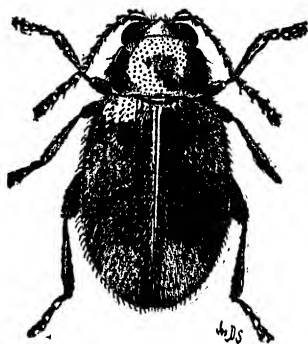
Leonard 32-127, 132 & 33-115, 123: on eggplant, potato.

EEWI-548: the common species on tobacco in P. R.

Leonard 31-116: on tobacco, potato and eggplant.

Danforth: at Mayagüez iii-30, Aibonito vi-34, La Plata v-29, Cayey xi-29, etc.

resting on grapefruit Cidra (I No. 4143); on weeds at Villalba (I No. 5864); feeding on tomatoes at Bayamón (I No. 5126), at Adjuntas (I No. 2244), at Ponce (I No. 3031); on potatoes at Cidra (I No. 1352, 1855, 5018); on squash at No. 5227); on *Physalis angularata* (201-12 det. E. A. Schwarz), on tomato (405-13); on potatoes at Jácome Alto (20-21); on tobacco at Aibonito (67-12, and SSC—det. E. A. Schwarz).



Epitrix parvula F. Twenty times natural size. (After Morgan & Gilmore.)

***Epitrix parvula* Fabricius**

Gundlach. Leng & Mutchler.

Wetmore 16-87: eaten by Cliff Swallow.

Van Z. (1104) on tobacco.

Merril 16-50: on tobacco, control.

Jones 16-6: on *Physalis*.

Cotton 16-88: food-plants, life-history and control.

Cotton 18-298: on eggplant.

More 21-6, fig. 2, a: notes.

Wolcott† 21-45: abundant on sugar cane at Garrochales and Morovis.

Wolcott 24-30: eaten by *Anolis stratulus*.

EEP-84: an economic account, as a pest of tobacco.

Danforth 26-117: eaten by Northern Parula Warbler.

Leonard 32-132, 141: on tobacco and eggplant.

EEWI-548: an economic account, as a pest of Solanaceous plants.

Danforth: at Cartagena Lagoon iii-31, Aibonito vi-34, Mayagüez iii-30, etc.

on tomato (I No. 4807); at Bayamón (I No. 4892), at Ponce (I No. 3031), on eggplant at Ponce (I No. 2571), at Loíza (I No. 2023); on *Solanum indicum* at Mayagüez (I No.

3241, 3697); on tobacco at Juana Díaz (I No. 2959, 3080); on *Physalis angulata* (200-12 det. E. A. Schwarz); on tobacco at Aibonito (SSC); "on *Cleome spinosa*, *Leptilon canadense*, *Lycopersicon esculentum*, *Solanum nigrum*, *Solanum torvum*, tomato and eggplant" R. T. Cotton.

Pseudoptrix hoffmani Bryant

Danforth: at Mayagüez v-29 det. Mutchler, Aguadilla xii-32, Las Marías xii-32.

Chaetocnema apicaria Suffrian

(as *Plectroscellis*) Stahl. Gundlach.

Leng & Mutchler.

Leng & Mutchler 17-212: from Vieques Island.

(as sp.) Wetmore 16-61, 106, 108: eaten by Ani, Yellow and Parula Warblers.

Jones 15-6: on sweet-potato and abundant on related weeds.

Wolcott 24-8, 23: its economic status, eaten by *Anolis krugii*.

EEP-123: on sweet potato.

Danforth: at Faro de Cabo Rojo iv-29, Guánica vi-34, Adjuntas vi-34, etc.

on sweet potato (I No. 2052); on squash at Guaynabo (I No. 3280); on cassava at Loíza (I No. 2025); on wild morning-glory at Ponce (I No. 4751); on tomato at Jayuya (I No. 2535-B Leonard 33-128), at Ponce (I No. 3031), at Loíza (I No. 4201 det. as sp.); on *Guilandina crista* and *Scirpus validus* at Ponce (I No. 3075, 4699); on *Volkameria aculeata* at Boquerón (338-23); on wild morning-glory (562-12 det. E. A. Schwarz); on sweet-potato at Comerío (765-13); abundant on *Ginoria rohrii* at Boquerón (173-22 det. E. A. Schwarz); making brownish curved slits in the underside of the leaves of mangrove at Mayagüez and at Martín Peña (GNW).

Chaetocnema nana Jacoby—det. G. E. Bryant

from grass growing on salty land at Salinas (244-21).

Systema basalis Jacq. Duval "La Pulga Americana" of tobacco-growers.

(as *Haltica basilca* Jacq.) Stahl.

Gundlach, "Ambos sexos difieren mucho".—or, more correctly, the sexes differ considerably from each other, the males are smaller and on each elytron have a broad median longitudinal golden band; the females have faint basal and apical spots on the elytra.

Howard 04-84; Barrett 04-448: on Russian sun-flower.

Leng & Mutchler. Van Z. (931) on beans, okra and beets.

Cotton 16-90 to 93, fig. 1: life-history, host-plants, control and illustrations of all stages.

More 21-5: same in Spanish.

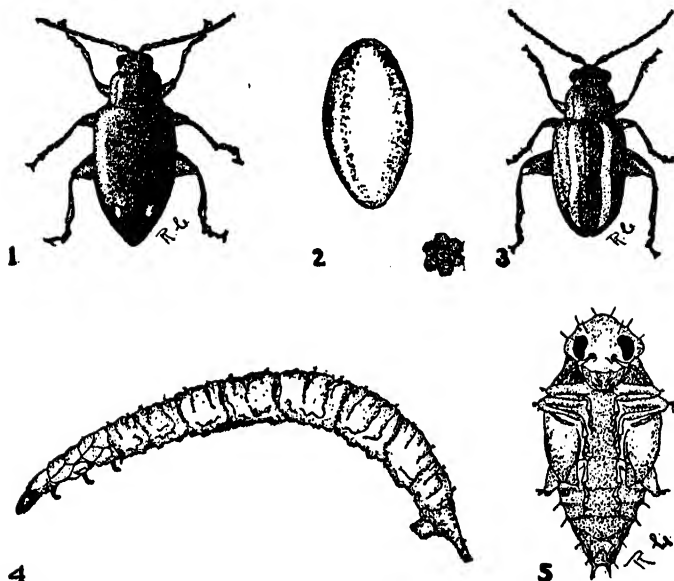
Wolcott 21-45: abundant on sugar cane at Aguada, Aguadilla and San Sebastián in December, 1919.

Wetmore 16-39, 87, 106, 114, 119, 128: eaten by Killdeer, Cliff Swallow, Yellow Warbler, Yellow-Shouldered Blackbird, Mozambique and Grasshopper Sparrow.

EEP-82, 110, 114; an illustrated, economic account, as a pest of tobacco, and on carrots and beets.

Danforth 26-100, 122: eaten by Yellow-Shouldered Blackbird and Northern Water Thrush.

May 27-6: eaten by Surinam toad, *Bufo marinus*.



Systena basalis J. Duval: 1, adult female, 3, adult male, 4, fully-grown larva, 5, pupa; all from eight to ten times natural size, 2, egg, greatly enlarged. (Drawn by R. T. Cotton.)

Wolcott, G. W., "Common Insect Pests Prefer Other Host Plants in Haiti". Jour. Ec. Ent., Vol. 20, No. 2, p. 429. April 1927: *Systena basalis* on cotton in Haiti, compared with preference for tobacco in P. R.

EEWI-548: on tobacco.

Danforth: at Jayuya xi-27, Juncos, xii-29, Mayagüez ii-27, etc. on eggplant at Bayamón (I No. 596); on potato at Carolina (I No. 3469), at Cidra (I No. 1854); on string bean (I No. 3279); on squash at Vega Baja (I No. 3835); on dahlia at Cidra (I No. 2611, 2612); on marigold flowers at Cidra (I No. 2903, 2904); on *Solanum indicum* at Mayagüez (I No. 3244); on carrots at Jayuya (I No. 2568); feeding on sweet-potato leaves (140-32), on leaves of *Phaseolus aureus*

(524-23), of *Arracasia xanthorrhiza* (523-23); attacking dahlia seedlings, *Coreopsis* and everlasting plants (19-33); on *Portulaca oleracea* (480-12 det. Schwarz, 481-12), on carrots and other vegetables (547-17), on tomatoes and eggplant (RTC), on *Valerianoides cayennense*, *Verbesina alata*, *Pluchea* and *Borreria* (504-16); on *Lantana camara* and *Melochia* sp., abundant on *Pluchea odorata* at Cayey (249-21); on *Bidens pilosa leucanthus* and *Synedrella nodiflora* at Comerío (766-13); on tobacco at Aibonito (SSC); on corn, cane and especially on beans at Aguadilla (30-22); on sugar cane at Aguada and San Sebastián (GNW).

Systema varia Weisc, J., 85-164: TYPE from P. R.

Gundlach. Leng & Mutchler.

(as sp.) Wetmore 16-87: eaten by Cliff Swallow.

Danforth: at San Germán, Dec. 26 1923 det. Blake.

temporarily a serious pest on cotton at Lajas (364-23 det. H. S. Barber).

Longitarsus (?) seminulum Suffrian—det. G. E. Bryant
on grass in saline waste at Salinas (245-21).

Longitarsus varicornis Suffrian

Danforth: at Algarrobo iii-31.

Gundlach. Leng & Mutchler.

very abundant on *Heliotropium indicum* (449-12 det. E. A. Schwarz, 463-16), at Caguas (113-21); on tomato at Villalba (I No. 3394), at Loíza (I No. 4201 det. as "sp.').

Longitarsus sp.

on *Tabebuia* at Ponce (I No. 4688); on weeds at Adjuntas (I No. 5851), at Matrullas Dam (I No. 5865).

Glyptina sp.

Wetmore 16-66: eaten by Tody, *Todus mexicanus*.

Phyllotreta fallax Suffrian

Gundlach. Leng & Mutchler.

Phyllotreta guatemalensis Jacoby—det. G. E. Bryant

Danforth: at Mayagüez ii-31 det. Mutchler, iv-29, Coamo iv-28.

Danforth 26-92, 112: eaten by P. R. Tody and Jamaican Cliff Swallow.

black or blue-black; prothorax and elytra dark blue, evenly and densely punctured; head dark blue-green, narrower than prothorax, which is not as wide as single elytron; length 2 mm.

abundant on *Cleome pentaphylla* at Mayagüez (123-Feb. 11, 1923, R. E. Danforth collector).

Aphthona auripennis Suffrian—det. Doris Blake

Danforth: at Algarrobo ii-31 det. Blake, Mayagüez xi-30.

at Juana Díaz (I No. 3081), on *Crotalaria* at Manatí (I No. 3637).

Aphthona compressa Suffrian

Gundlach. Leng & Mutchler. AMNH at Aibonito and on Desecheo Island.

Danforth: at Yauco iii-29 det. Mutchler, Mayagüez ii-27, Boquerón iv-29, Algarrobo iii-31 det. Blake, Guánica vi-34, Adjuntas vi-34. Ponce x-134, etc.

with blue elytra: on *Heteropteris laurifolia* (251-12 det. E. A. Schwarz); at Pt. Cangrejos (135-23), at Vega Baja (537-16), at Caguas (GNW); very abundant on *Volkameria aculeata* at Boquerón (84-23, 337-23); one with purple elytra: on coffee at Utuado (474-21); another on *Inga laurina* at Mayagüez (252-23), these the true *A. compressa* det. G. E. Bryant; at Adjuntas (I No. 4306); at Manatí (I No. 5343); on "mabí" at Mayagüez (I No. 4731 as "sp."); at Ponce (I No. 4501, 4750 as "near").

Aphthona maculipennis Jacoby

Leng & Mutchler 17-212.

on *Phyllanthus lathyroides* (869-14 det. E. A. Schwarz); on *Myrcia cerifera* at Guánica (I No. 5803 det as "near").

Megistops lituratus Olivier—det. H. S. Barber

on *Scirpus validus* at Ponce (I No. 4752-C); on roble at Ponce (I No. 4770).

Megistops fictor Weise, J., 85-162: TYPE from P. R.

Gundlach. Leng & Mutchler.

at Adjuntas (I No. 4366 as "sp."); on *Tabebuia* at Guánica (I No. 5698).

Chalepus sanguinicolis Linnaeus

(as *Odontota axillaris* Dej.) Stahl. Gundlach.

Leng & Mutchler.

Leng & Mutchler 17-212: from Vieques Island.

on weeds (474-16, 406-17), at Vega Baja (515-16 det. R. T. Cotton); at Adjuntas (I No. 3225), at Añasco (I No. 4264); on almendra flowers at Arecibo (I No. 2416 Leonard 33-129); on *Crotalaria* at Manatí (I No. 4392).

Ochthispa loricata Weise, J., 85-166: TYPE from P. R.

Gundlach. Leng & Mutchler.

Wolcott 26-50: on sea-grape at Macuto, Venezuela, NOT in P. R.

Mesomphalia exclamationis Linnaeus

Gundlach. Leng & Mutchler.

(as sp.) Wetmore 16-59: eaten by Cuckoo.

(as *Hilarocassis*) on *Ricinella ricinella* at Ponce (I No. 4498).

Chelymorpha argus Lichtenstein, var. **geniculata** Dejean

Gundlach. Leng & Mutchler. Cotton 18-309: on sweet-potato. EEP-123: on sweet-potato. EEWI-641: a pest only in P. R. Danforth: at Mayagüez xi-27.

Chelymorpba polysticha Boheman

Gundlach. Leng & Mutchler.

Danforth: at Barros ix-30

Danforth 26-101: eaten by P. R. Oriole.

on wild morning-glory, *Ipomoea* (835-14); on sugar cane at Juncos (659-17 det. E. A. Schwarz); on eggplant at Juncos (RTC).

Metrioria quadrisignata Boheman—det. H. S. Barber

Danforth: at Aibonito vi-34.

at Ponce (I No. 4482).

Coptocycla bisbinotata Boheman

Gundlach. Leng & Mutchler.

Coptocycla glaucina Boheman C. H., "Monographia Cassidarum"

Vol. 3, pp. 333-334. 1865: TYPE from P. R.

Leng & Mutchler.

Chirida (Coptocycla) guttata Olivier

Stahl. Gundlach. Leng & Mutchler.

(as *C. signifera*) Wetmore 16-61, 79, 87, 91, 114, 116, 128: eaten by Ani, Kingbird, Cliff Swallow, Mockingbird, Yellow-Shouldered Blackbird, Oriole and Grasshopper Sparrow.

(as *Coptocycla signifera* Herbst) Jones 16-6: on sweet-potato. Cotton 18-307: on wild morning-glory and sweet-potato leaves.

(as sp.) Danforth 26-73: eaten by Semipalmated Sandpiper. EEP-123: on sweet-potato.

Danforth: at Jayuya ix-30, Añasco x-30, Florida xii-30, Yauco iv-31, Mayagüez x-29, xii-30. etc.

AMC: also at Boquerón ii-30, Luquillo vii-32, Ponce xii-33, etc. on sweet-potato at Arecibo (I No. 2884); on *Peirania* at Ponce (I No. 4481); on wild morning-glory at Añasco (I No. 4262), at Caguas (102-16, 247-21), at Juncos (660-17); on sugar cane, accidentally, at Yauco (314-21).

MYLABRIDÆ (BRUCHIDÆ)

Catoni, L. A., "Gorgojos que atacan a las Habichuelas y Guisantes."

Rev. Agr. P. R., Vol. 10, No. 3, pp. 49-51. San Juan, 1923.

Pachymerus giganteus Chevrolat (*curvipes* F. ?)

Leng & Mutchler.

Megacerus sp.—det. H. S. Barber

on pomarrosa at Ponce (I No. 4517, 4518, 4519, 5747), at Aibonito (I No. 4766); on *Scirpus validus* at Juana Díaz (I No. 4525).

Bruchus xanthopus Suffrian—det. H. S. Barber

on ? at Guánica (I No. 5709); on flowers of *Randia mitis* at Ponce (I No. 4476 as "near *xanthopus*"); on *Peirania* at Ponce (I No. 4479, 4517-B as "near").

Bruchus sp.—det. H. S. Barber

on flowers of *Inga laurina* at Adjuntas (I No. 3888), of pomarrosa at Aibonito (I No. 3888-B); on cotton at Guayanilla (I No. 3734).

Acanthoscelides ochraceicolor Pic—det. H. S. Barber

on flowers of *Guazuma* at Ponce (I No. 4474), of ? at Yauco (I No. 5652 as "sp").

Acanthoscelides sallei Sharp—det. R. T. Cotton

at Ponce (I No. 4607 ?—det. H. S. Barber); on *Acacia* pods at Fortuna, Ponce (I No. 5076 as "near"), at Guánica (I No. 5711 as "near"); on flowers of *Scirpus validus* at Ponce (I No. 4478 as "near *sallei*"); in pods of *Acacia farnesiana* at Boquerón (100-23 det. R. T. Cotton).

Callosobruchus maculatus F.—det. H. S. Barber

(I No. 4829); on avocado at Utuado (I No. 2656); on moca at Ponce (I No. 4301).

Gibbobruchus sp.—det. H. S. Barber

on *Scirpus validus* at Ponce (I No. 4526).

Amblycerus (Spermophagus) sp.—det. H. S. Barber

on *Inga laurina* at Juana Díaz (I No. 3991).

Zabrotes subfasciatus Boheman—det. H. S. Barber

(as sp.) Wetmore 16-82, 84, 108: eaten by Flycatcher, Wood Pewee and Parula Warbler.

at light (I No. 4247, 4387, 4419), at Bayamón (I No. 3362); in lima beans at Bayamón (I No. 3762); in peas at Ponce (I No. 2815).

Bruchus centromaculatus Allard (? *cinerifer* Sch.)

(as *B. cinerifer* (Chev.) Sch.) Gundlach, "se encuentra en la flor de Júcaro, *Terminalia*".

Leng & Mutchler.

Bruchus chinensis Linnaeus

Leng & Mutchler. Van Z. (1511) in stored cowpeas and beans. Wolcott 22b-5: notes.

EEP-126:

in dried cowpeas from Virginia at Ponce (335-19); at light at Guánica (593-13); (as *Callosobruchus*) on *Crotalaria* flower at Mayagüez (I No. 5817 det. H. S. Barber); from pigeon peas (I No. 1178 Leonard 32-136); from pepper crate (I No. 2128 Leonard 33-135); from lima beans at Ponce (I No. 2524).

Bruchus obtectus Say

Van Z. (1504) in beans. Wolcott 22b-5: notes. EEP-126.

Danforth: at Guánica vi-34, Río Piedras ii-29, Mayagüez v-29. in beans 515-17), at San Lorenzo (352-23), from Venezuela (155-17).

Bruchus livens Suffrian—det. E. A. Schwarz
on arrows of sugar cane (378-22).

Bruchus pectinicornis Linnaeus
Stahl.

Bruchus pisorum Linnaeus
Wolcott 22b-5: notes. EEP-126:
Danforth: at Río Piedras ii-29, Mayagüez v-31.
in peas from Spain (1029-16).

Bruchus quadrimaculatus Fabricius, var. **barbinicornis** Fabricius
Leng & Mutchler. Wolcott 22b-5: notes. EEP-126:
in peas from Georgia 135-11); in cowpeas (611-17), at
San Juan (97-19), at Ponce from New York (336-19, 544-19).

Mylabris rufimanus Boheman—det. E. G. Smyth
in broad beans from Spain (1031-16—no specimens).

Bruchus dominicanus Jekel—det. G. E. Bryant
(as *Bruchus* sp.) Wetmore 16-75: eaten by Jamaican Black
Swift.
from pods of algarroba, *Hymenaea courbaril* (62-11); from
pods of aroma, *Acacia farnesiana* at Guánica (42-14, 44-14),
at Boquerón (110-23).

Spermophagus pectoralis Say
Wolcott 22b-5: notes. EEP-126.
Danforth: at Mayagüez x-30. Río Piedras ix-31.
in beans (151-17), from Venezuela (619-17).

BRENTIDÆ (BRENTHIDÆ)

Paratrachelizus (near *linearis*)—det. L. L. Buchanan
on *Scirpus validus* at Ponce (I No. 4710).

Trachelizus linearis Suffrian
Gundlach, "debajo cortezas".
(unlabeled specimens, entirely dull, dark brown, determined
as sp. by Dr. Schwarz.)

Belophorus maculatus Olivier
Leng & Mutchler. AMNH at Aibonito.
on coffee leaf at Ciales (233-22 det. Schwarz); on guava at
Ponce (I No. 3619), at Matrullas Dam (I No. 5866); on
flowers of *Inga vera* at Yauco (I No. 4541).

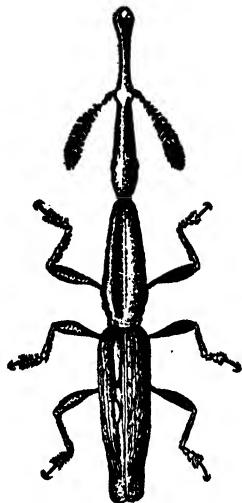
Belophorus militaris Olivier
Gundlach, "debajo de la corteza muerta".

Brentus turbatus Boheman
Stahl. Gundlach. (as *Brentus nasatus* F.) Ledru 1780.

Brentus volvulus F.—det. E. A. Schwarz

Danforth: at Yauco xi-30, Maricao ix-28, Bayamón xii-31, **many** at Mayagüez.

AMC: at Cabo Rojo xi-26, Yauco iii-31, Luquillo vii-32, **Ponce** xii-33, etc.



Brentus volvulus F. Twice
natural size. (Drawn
by F. Maximilien.)

on cotton at Aguadilla (124-31); on corn at Mayagüez (535-23); a pair on grapefruit blossoms at Mayagüez (I No. 2385, 2386); at Ponce (I No. 4316 as "near"); under bark of decaying bucare tree, *Erythrina glauca*, at Cayey (166-16, 244-17, 357-22); under bark of mango tree at Añasco (508½-13); on coffee leaves at Yauco (143-21); at Corozal (136-22), at Aibonito (SSC).

PLATYSTOMIDÆ (ANTHRIBIDÆ)

Brachytarsus sp.—E. A. Schwarz

from pods of *Acacia farnesiana* at Boquerón (138-23).

Ormiscus sp.—det. L. L. Buchanan

Danforth: at Coamo iii-29 det. Mutchler, Algarrobo iii-31.

on *Inga laurina* flowers at Yauco (I No. 3869); **another** species on mocha, pomarrosa, orange and *Randia mitis* at **Ponce** (I No. 3988, 4317, 4464, 4463, 4601); at Adjuntas (I No. 4309); at Garrochales (I No. 5384); on dead wood at **Ma-**trullas Dam (I No. 5845).

Neanthribus sp. nov.—det. L. L. Buchanan

on pomarorsa at Ponce (I No. 4462).

Gymnognathus sp. nov.—det. L. L. Buchanan
on dead wood at Yauco (I No. 5481).

† **Homocloeus** sp.—det. L. L. Buchanan
on moca at Ponce (I No. 4300); on coffee at Adjuntas (I
No. 4302); on guava at Aibonito (I No. 4354).

CURCULIONIDÆ

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V, Vol. 6, Bulletin, pp. 227-229,
1876.

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pt. 2, pp. 487-489, 1888.

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vils (Curculionidae)" in Bull.
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59-78, pl. 2, fig. 4. London, May
1922.

Wolcott, G. N.,
22a-1 to 20 "Vaquitas de Importancia Económi-
ca en Puerto Rico." Circ. No.
60, Estación Experimental Insu-
lar, Río Piedras, P. R., pp. 1-
20, fig. 20. San Juan, October
1922.

Wolcott, G. N., "Otiorhynchids Oviposit between Pa-
per." Jour. Ec. Ent. Vol. 26,
No. 6, pp. 1172-1173. Geneva,
N. Y., December 1933.

Mr. L. L. Buchanan has made all the determinations of specimens
in this family recorded under Interception Numbers, and to him the
compiler is indebted for the preliminary tabulation of the species
of *Anthonomus* here given, and for other information.

Attelabus coccolobae Wolcott, G. N., IP-123 to 124: TYPE from
Pt. Salinas, P. R., feeding on tender leaves at sea-grape, *Co-
coloba uvifera*.

Marshall, Guy A. K., "Two New Species of Curculionidae (Col.)
from Haiti". Bull. Ent. Research, Vol. 17, pt. 1, pp. 53-54.
London, July 1926: generic transfer to *Euscelis*. "In the
original description of the species, the characters of the sexes
were reversed."

Wolcott 22a-6: method of oviposition and notes.

Wolcott 26-50: also in St. Thomas.

Danforth: at Joyuda v-31, Aguada, v-32, Aguadilla xii-32,
Guánica vi-34.

on host at Pt. Salinas (231-16, 66-22, 54-23 TYPE, 127-23), at Pt. Cangrejos (398-22), at Algarrobo (198-22), at **Isabela** (207-21); at Humacao Playa (286-23), at Arecibo (360-23), common at Mameyes (GNW), at Guanajibo, Mayagüez (I No. 5779); on *Trophis racemosa* at Ponce (I No. 4451).



Attelabus sexmaculatus Chevrolat. Six times natural size. (Drawn by G. N. Wolcott.)

***Attelabus sexmaculatus* Chevrolat 76-228: TYPE from P. R.**

Stahl, also as *A. aureolus* Klug, which Gundlach states occurs in Cuba, but not in Porto Rico.

Gundlach. Leng & Mutchler.

(as *A. bipustulosus* Jekel)—this is the determination by Dr. W. Dwight Pierce of apparently identical specimens from the same host.

Van Z. (P. R. 1024) on *Psidium guajava* and *Eucalyptus* sp. Leng & Mutchler 17-217.

Wolcott 22a-6, fig. 1: notes, figure of adult and parasitism of egg by *Poropoea attelaborum* Girault. EEWI-517: on guava.

Danforth: at Maricao iii-29, Caguas xii-29, Guánica vi-34, Ponce vii-34, Mayagüez xi-28. AMC: also at Cabo Rojo xi-30, San Germán xii-33, Luquillo vii-32, etc.

on *Psidium guajava* (330-16 det. Schwarz), at Trujillo Alto (GNW—det. Schwarz), at Aibonito (SSC), at Añasco (1040-13), at Río Piedras (I No. 2435), at Cayey (212-23), at San Sebastián (19-32), at Mayagüez (I No. 5776), at Arecibo (I No. 5432 Leonard 33-129); on "almendra", *Terminalia catappa* (92-21, 11-33), at Bayamón (I No. 2065).

***Cylas formicarius* Fabricius**

Jones 16-6: on sweet potatoes. Cotton 18-308: notes.

Cotton, R. T., "*Cylas formicarius* Fabr. in Flight" in Jour. Ec. Ent., Vol. 9, No. 5, October, 1916, p. 516.

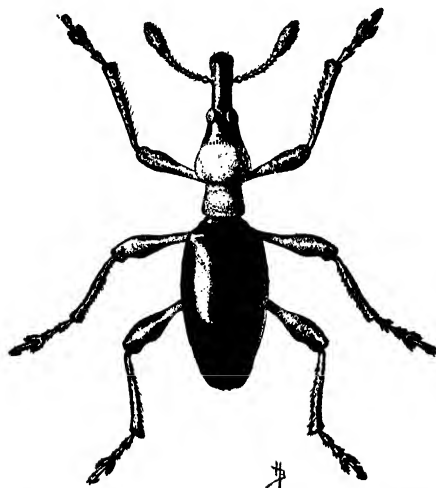
More, J. D., "La Vaquita o Piche de la Batata" Circular 34, Estación Experimental Insular, Río Piedras, P. R., pp. 7, pl. 1. San Juan, January 1921.

Wolcott 22a-7: notes and control, illustration of adult.

EEP-123: "El Piche"—an economic account.

Wolcott 24-17, 30: eaten by *Anolis pulchellus* and *A. cristatus*.

Sasseer, E. R., "Important Insects collected on Imported Nursery Stock in 1920." Jour. Ec. Ent., Vol. 14, No. 4, p. 354. Geneva, N. Y., August 1921: interception in sweet potato tubers from P. R.



Cylas formicarius F. Ten times natural size. (Drawn by H. Bradford.)

Catoni, L. A., "Plagas de Insectos que atacan a las Plantaciones de Batatas." Rev. Agr., P. R., Vol. 9, No. 3, pp. 25-28. San Juan, 1922.

López Domínguez 27-49: varieties of sweet-potatoes not attacked.

Leonard 31-119, 32-137 & 33-124: locality records.

Wolcott 33-266: does most damage in poorest soil.

EEWI-647: an economic account.

Danforth & AMC: many records: at Cabo Rojo xii-30, Utuado vii-30, Yabucoa vi-31, Barranquitas -32, Yauco ii-31, etc.

(I No. 977, 1504): at light (114-12, 297-12, 315-12), in *Ipomoea* with tuberous root (584-12), in sweet potatoes (682A-17, 683A-17, 684A-17), adults eating stems, midribs and larger leaf veins (139-32), at Las Cabezas (94-16), at Fajardo (93A-18, 94A-18), at Isabela (212-21); on goat's foot morning-glory, beach at Mameyes (73-33); in roots of *Guilandina crista* at Ponce (I No. 3119).

Apion subaeneum Gerstaecker, Carl, E. A., "Beschreibung neuer Arten Apion" in Stett. Ent. Zeit., Vol. 15, pp. 234-261, 265-280, 1854: TYPE from P. R.

Leng & Mutchler. Leng & Mutchler 17-218: "*Apion portoricanum* Gerstaecker is a synonym of *subaeneum* Gerstaecker (Wagner, Mem. Soc. Belg. 1912. XIX, p. 36)." (as sp.) Wetmore 16-104: eaten by Adelaide's Warbler.

Apion martinezi Marshall, Guy A. K., (as *xanthoxyli*, not "*xanthoxyli* Fall" of Texas). "New West Indian Curculionidae (Col.)" Ann. and Magazine Nat. Hist., Ser. 10, Vol. 14, pp. 629-630. London, December 1934: TYPE from Guánica Forest Reserve, P. R., reared from seeds of W. I. Satinwood, *Zanthoxylum flavum*, "acetillo".

about 40% of seeds infested at Camp Buena Vista, elev. 2700 ft., Maricao, reared by E. Martínez (1-34 "somewhat related to *Apion xanthoxyli* Fall of Texas" det L. L. Buchanan); over half of the seeds infested from a tree at Guánica, coll. O. R. Torres, (143-32 TYPE).

Apion sp. (neither of the above—L. L. Buchanan)

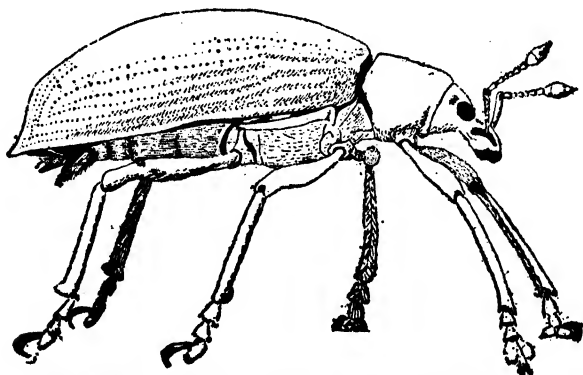
on flowers of *Ricinella ricinella* at Ponce (I No. 4433); on leaves of *Peirania* at Ponce (I No. 4613).

Artipus sp.—det. L. L. Buchanan

on leaves of castor bean at Ponce (I No. 4434); on "mabi" at Mayagüez (I No. 4738).

Prepodes quindecimpunctatus Olivier

Stahl. Chevrolat 76-227. Gundlach. Leng & Mutchler.



Prepodes roseipes Chevrolat. Six times natural size.
(Drawn by G. N. Wolcott.)

Prepodes (or **Exophthalmodes**) **roseipes** Chevrolat (as **Pachnaeus**) 76-227: TYPE from P. R.

(as *Pachnaeus*) Stahl. Gundlach. Leng & Mutchler.

(as the "smaller orange-leaf weevil, or 'green bug'") Tower 11a-9: "In the San Juan district and near Arecibo----in

sandy soils.----January and February---- eggs in clusters between the leaves----number 6 to 24----scarring fruit in June, 108----eating the orange leaves, especially the new growth."

Marshall 22-60: generic transfer to *Exophthalmodes*.

Wolcott 22a-18, fig. 19: a general account, figure of adult.

Wolcott 25-36: adult ate its own weight of food daily.

EEP-65: as a pest of citrus.

Wolcott 26-50: as *Pachnacus*, feeding on sea-grape leaves.

Dexter 32-5: eaten by Surinam toad, *Bufo marinus*.

Leonard 32-125: on citrus.

Wolcott 33-1172: females oviposit between paper.

EEWI-450: as a pest of citrus.

Danforth: at La Tortiguera xii-27, Luquillo vii-32, Aguada xi-27, Añasco xi-27, etc.

AMC: thirty records, at Naguabo vii-32, Jayuya iv-21, Boquerón ix-31, etc.

on grapefruit at Bayamón (I No. 40, 53, 142, 165), at Barceloneta (I No. 12, 546, 3677), at Añasco (I No. 1083), at Vega Alta (I No. 2220), at Manatí (I No. 2341), at Arecibo (I No. 5458), at Palo Seco (I No. 519); feeding on orange or grapefruit leaves (41-15), at Loíza (191-21), at Pt. Cangrejos (GNW), at (Isabela grove or Plantaje) Pt. Salinas (181-15 det. Marshall), at Vega Baja (496-16), at Espinosa (67-15), at Manatí (153-15, 146-20, 66-33), at Dorado (70-22), at Santana (212-16), at Arecibo (153-15; on cotton at Isabela (159-21, 112-31); on *Inga vera* (86-21); on *Inga laurina* at Lares (153-21); on *Dalbergia Ecastophyllum* at Mayagüez (257-23, 213-23), and also on "moca", *Andira inermis*, at Algarrobo (197-22); on injured cotton boll at Loíza (379-22); on icaco, *Chrysobalanus icaco*, at Pt. Cangrejos (391-22); at Palo Seco April 7, 1931 (GNW), at Isabela (112-31, 66-33); on *Conocarpus erecta* on beach west of Arecibo (167-23), at Pt. Salinas (52-23); on tender leaves of sea-grape, *Coccoloba uvifera*, at Loíza (121-22), 1 mm. longer than the largest *E. roseipes* (10 mm.) and refusing to eat tender grapefruit leaves, but no apparent structural difference; abundance and of normal size on this host at Arecibo (359-23 det. Marshall).

Exophthalmodes sp.—det. L. L. Buchanan

(I No. 2506 as ?); on *Torrubia* at Aibonito (I No. 5749 as ?); on pomarrosa at Ponce (I No. 4749); on *Casearia* at Ponce (I No. 4459).

Compsus maricao Wolcott, G. N., IP-125 to 126: TYPE from Maricao, P. R.

Danforth: at Villalba vi-34, vii-34.

a single female, which had laid eggs between coffee leaves

at Maricao (388-21 TYPE); at Yauco (I No. 5651); another specimen in U. S. Nat. Museum, coll. by R. H. Van Zwaluwenburg in mountains back of Mayagüez.

Diaprepes capsicalis Marshall 22-59 and 60, TYPE from Porto Rico: "Integument black or piceous, fairly densely clothed above and below with brown or brownish-grey scaling, often with a coppery reflection; elytra with a pale dot about the middle of interval five. Length 8-12mm."

(as *Exophthalmodes*) Wolcott 22a-20: eating "fresas".

Danforth: at Luquillo vi-32, Yauco vi-34.

on weeds (830-14), at Jayuya (I No. 3117), on *Eupatorium odoratum* (340-16), eating pepper leaves (568-17, 596-17 TYPE); eating "fresas", the fruit of *Rubus rosaefolius* det. L. H. Bailey, at Jájome Alto (148-21), on ground under fresa bush at Jájome Alto (362-22); on carrots at Villalba (I No. 4877); on ground in sweet potato field being plowed at Cidra (28-34).

Diaprepes abbreviatus Linnaeus—determined Sir Guy A. K. Marshall, or

Diaprepes spengleri Linnaeus—determined Dr. W. Dwight Pierce. (as *Prepodes doublieri* Guérin) Stahl.

(as *D. distinguendus* Boheman and *D. comma* Boheman, not in synonymy) Gundlach, after Chevrolat 76-227.

(as *D. distinguendus* Boheman and *D. comma* Boheman, not in synonymy) Gundlach, after Chevrolat 76-227.

(as *D. distinguendus* Boheman, *D. comma* Boheman, and *Exophthalmus spengleri* Linnaeus, not in synonymy) Leng & Mutchler.

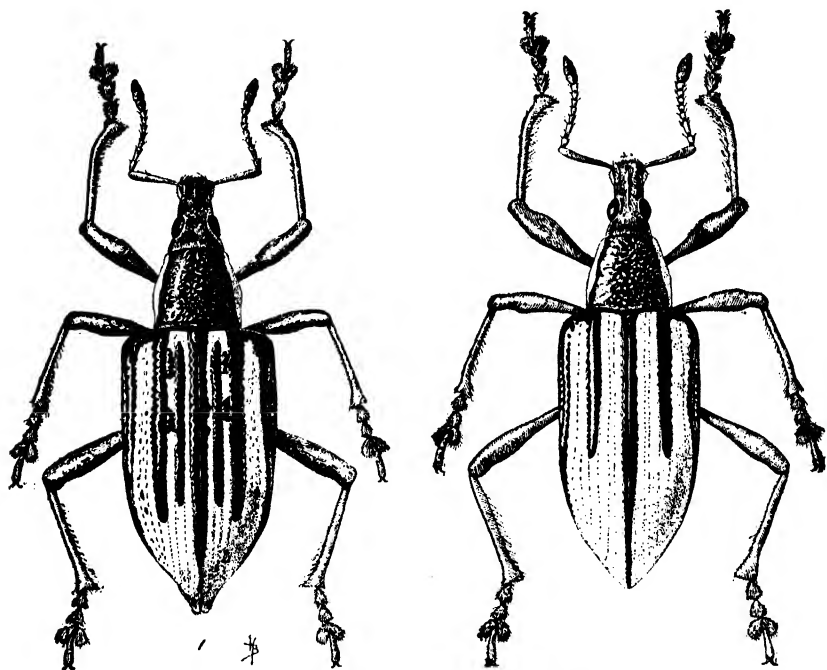
Jones, Thos. T., "The Sugar Cane Weevil Root Borer (*Diaprepes spengleri* Linn.)" Bull. 14, Insular Experiment Station, Río Piedras, P. R., pp. 19, fig. 11. San Juan, April 14, 1915: an extended economic account.

Pierce, W. Dwight, "Some Sugar Cane Root-Boring Weevils of the West Indies". Jour. Agr. Research, Vol. 4, No. 3, pp. 255-271, pl. 5, June 15, 1915: the "weevil root-borer" of sugar cane in Porto Rico as *D. spengleri* Linn., with three varieties, *abbreviatus* Olivier, *comma* Boheman and *spengleri* Linn. Reviewed by Dr. Marshall in Rev. App. Ent., Vol. 3, 1915, p. 627: "It is to be regretted that the author has adopted the name *D. spengleri* for the destructive root-borer of sugar cane, seeing that *D. abbreviatus*, L., is not only the older and therefore more correct name, but is also in general use in the West Indies. The name *abbreviatus* should therefore be substituted for *spengleri*."

Marshall, G. A. K., "On New Neotropical Curculionidae" Ann. & Mag. Nat. Hist., Vol. 18, No. 108, December 1916, pp. 449-

469: "The variety figured by Mr. Pierce as *D. comma*, Boh., is *D. doublieri*, Guer., the true *D. comma* occurring in Venezuela and Trinidad."

Wetmore 16-10: the adults constituted a considerable portion of the stomach contents of the following birds: Petchary 18.47%, Kingbird 17.19%, Flycatcher 11.22%, Mozambique 9.69%, Ani 7.09%, Owl 1.8%, Yellow-Shouldered Blackbird 1.72%, and had been eaten by ten other large birds.



Diaprepes abbreviatus L. Five times natural size.
(Drawn by H. Bradford.)

Hutson, J. C., "Some Weevils of the Genus *Diaprepes* in the West Indies". Agr. News, Barbados, Vol. 61, No. 398, p. 186. Bridgetown, 1917: listing the P. R. species.

Wolecott 22a-15 to 16, figs. 6: a short economic account, with illustrations of eggs and larva in injured cane (original) and of larva and the three varieties of the adult (after Pierce and with his nomenclature).

Barrow, E. H., "White Grubs, *Lachnosterna* sp., and Larvae of the Weevil Root-Borer, *Diaprepes spengleri* L., attacking Sugar-Cane in the Guánica District of Porto Rico, and Methods Practised for Controlling Them". Jour. Dept. Agr. P. R., Vol. 8, No. 2, pp. 22-26. San Juan, November 1924: nearly

- 12,000,000 beetles collected from pigeon peas planted about the cane fields in 1923, and grubs from infested cane stools.
- EEP-32 to 36, 65: an illustrated, economic account, as a pest of sugar-cane and citrus.
- Wolcott 24-6, 30: no parasites known at this time, eaten by *Anolis cristatellus*.
- Danforth 26-23, 88 to 101: abundant near Cartagena Lagoon, eaten by Bare-legged Owl, Mangrove Cuckoo, P. R. Oriole and Ani.
- Wolcott 26-50: not on sea-grape.
- Earle 28-175: a practical account.



Larva of *Diaprepes abbreviatus*
L. in rootstalk of sugar-cane.
Half natural size. (Drawn
by F. Seín.)

- Seín 30-180: type of injury produced by feeding of the larva.
- Danforth 31-72: eaten by Bare-legged Owl.
- Leonard 31-110, 32-123, 125, 134: on citrus, string beans, sugar cane and grapefruit.
- Faxon & Trotter 32-446: on foliage of citrus trees.
- Dexter 32-4: "*Phyllophaga* and *Diaprepes abbreviatus* constituted 41% of the total food of the toads."
- Wolcott 32-409: abundant after the hurricane of San Ciprián.

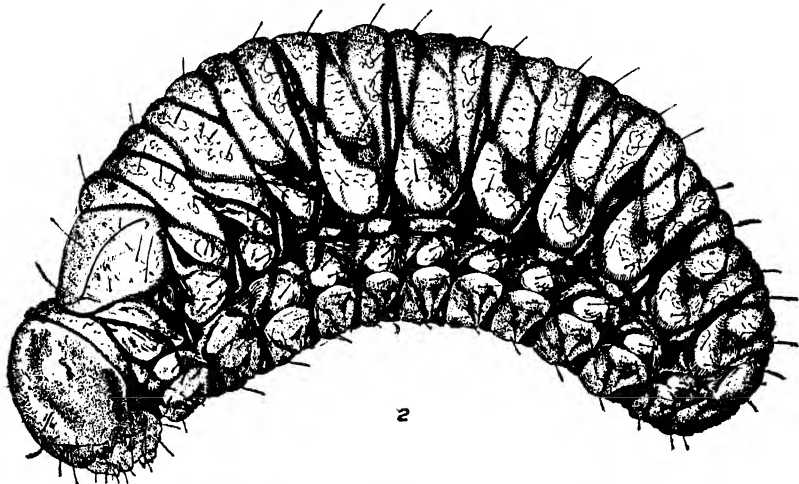
Leonard 33-115: collection of egg-clusters on *Ficus* at Santa Isabel.

Wolcott 33-1172: females oviposit between paper: a discovery of Dr. Herbert Osborn Jr. at Aguirre. (the same data in Wolcott 33-46:)

EEWI-2: a cow weighs 400,000,000 times as much an adult "vaquita".

EEWI-133 to 141 and 452 to 461: an extensive, illustrated account as a pest of sugar-cane, and of citrus.

Wolcott 34-92 to 94: a report on investigations in progress.



Larva of *Diaprepes abbreviatus* L. Five times natural size.

(Drawn by H. Bradford.)

Wolcott, G. N., "The Larval Period of *Diaprepes abbreviatus* L." Jour. Dept. Agr. P. R., Vol. 17, No. 3, pp. 257-264, ref. 2, pl. 1. San Juan, November 14, 1933: rearing data in the first complete life-histories.

Wolcott 33-269: no appreciable decrease in numbers yet due to toads.

Wolcott, G. N., "The Diapause Portion of the Larval Period of *Diaprepes abbreviatus* L." Jour. Agr. Univ. P. R., Vol. 18, No. 3, pp. 417-428, ref. 1, fig. 2. San Juan, October 27, 1934: a continuation of life-history rearings.

Tucker 34-16: summary of the attempts at introducing egg-parasites of, from P. R. into Barbados.

Danforth: at Jayuya xi-27, Lajas v-29, etc.

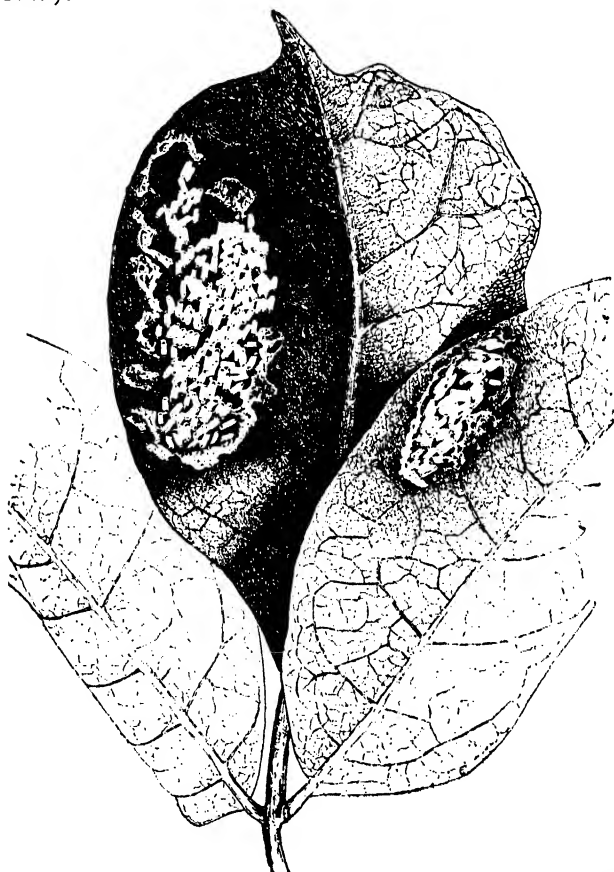
AMC: many records.

(the varieties vary only in appearance, not in habits or economic importance, although *comma* or *doublieri* is less common than the others and, except in a few cases, will not be specified in the following records) at light (102-11, 89-15),

on leaves of sugar cane (5-15, 6-16, 9-15, 27-15), at Mameyes (80-8-12), at Fajardo (128-11), on Vieques Island (GNW—var. *doublieri*), at Yabueoa (71-11, 40-2-12), at Maunabo (517-12), at Santa Isabel (90-11, 415-13), at Aguirre (99-11, 373-13, 786-13, 884-13), at Fortuna (114-11, 115-11), at Guánica (18-10, 331-13, 762-15, 790-15), at Añasco (365-12), at Arecibo (185-11), at Toa Baja (94-15); on grass (20-12), at Humacao (58-10), at Guánica (44-10, 503-13); on celery (61-17); eating petals of yellow calthrops at Puerta de Tierra (17-34); eating double Hibiscus blossoms at Mayagüez (A. H. Rosenfeld, October, 1934); on *Spondias lutea* or "jobo" (993-13, 994-13, 901-14, 97-15) at Luquillo (194-13), at Fajardo (38-15), at Yabueoa (100-15), at Santa Isabel (706A-13), at Arecibo (146-13, 17-15), at Manatí (62-15); on *Inga vera* at Cidra (46-33); on "moca", *Andira inermis*, at Ponce, Patillas and Isabela (110-31); on icaco, *Chrysobalanus icaco*, (70-5-13, 901-14, 88-15), at Pt. Cangrejos (26-15); on bucare *Erythrina micropteryx*, (901-14), at Palo Seco April 7, 1931 (GNW); at Toa Baja (121-16); on *Ficus laevigata* at Palo Seco (230-16); at Cidra (46-33); on leaves of grapefruit (172-16); at Bayamón (152-32) and on orange at Vega Baja (708-13); on *Cassia tora* (959 to 965-14, 849 to 851-14, 893 to 896-14, 524-16), at Arecibo (524-16); on *Cassia aeschynomene* (290-16); on cassava or "yuca" at Coamo (46-34); on *Psidium guajava* (899-14, 44-18), at Barceloneta (109-16), at Villalba (109-31), at San Sebastián (117-32); on *Persea gratissima* (720-17); on "ceiba" at Loíza (GNW); on mustard at Barceloneta (82-11); eating leaves and calyx of cotton at Garrochales (305-22); in mountains north of Yanco ovipositing between coffee leaves (384-21); on unidentified tree at Ciales (215-22); feeding on leaves of Humboldt's willow at Aguadilla (225-22, var. *spengleri*, scales white, but with broad lateral vitta of bright pink or alizarine crimson); on *Mimosa ceratonia* (643-12), at Dorado (714-13); on velvet beans (524-16), on *Amaranthus spinosus* at Santa Isabel (418-13), at Salinas (32-15); on *Parthenium* sp. at Santa Isabel (418-13); on *Ricinus communis* at Guánica (503-13) and on following hosts listed by E. G. Smyth; *Guazuma guazuma*, *Tamarindus indicus*, *Melicocca bijuga*, *Acnistus arborescens*, *Schrankia portoricensis* and *Agati grandiflora*.

on grapefruit at Bayamón (I No. 8, 48, 357, 367), at Trujillo Alto 11, 47), at Vega Alta (I No. 33, 4107, 5350), at Vega Baja (I No. 141), Pueblo Viejo (I No. 749), at Mayagüez (I No. 506); on orange at Trujillo Alto (I No. 692); on sour lime at Aguadilla (I No. 507); on citron at Las Marias (I No. 1045); on eggplant at Manatí (I No. 608); on lima bean at Vega Baja (I No. 1644); on ñame foliage at Isabela (I No. 5826); on banana at Corozal (I No. 4118); on "almendra", *Terminalia catappa*, at Manatí (I No. 1036), at Arecibo (I No. 1468); on cotton at Humacao (I No. 1143).

Larvæ attacking roots of sugar cane (395-13), at Luquillo (944-13), at Aguirre (382-13), at Fortuna (364-13, 367-13, 384-13), at Santa Isabel (930-13); at Ponce (I No. 3481); of grapefruit at Palo Seco (I No. 606); of pepper at Juana Díaz (I No. 3623), at Isabela (GNW); of "yuca" at Cayey (GNW).



Egg-clusters of *Diaprepes abbreviatus* L., between leaves of jojoba. Twice natural size. (Drawn by F. Scin.)

Eggs between leaves of sugar cane, and of grass at Santa Isabel (701-13, 847-14), of *Chrysobalanus icaco* (849-14), of *Spondias lutea* at Ponce (GNW); of citrus at Isabela, Florida, Dorado and Río Piedras (GNW).

Lachnopus coffeae Marshall 22-60 to 61, pl. fig. 8; TYPE from Porto Rico: "Integument piceous with legs, antennae and apex of rostrum reddish brown: clothed above and below with small,

convex, shiny, subcircular or very shortly ovate, white scales
 ---mostly not contiguous---the elytra usually with three
 very irregular transverse subdenuded patches. Length 5.5—
 6.25 mm.; breadth 1.8—2 mm.”

Van Leenhoff 06-46: as leaf weevil on coffee.

Van Zwaluwenburg 17-515: “the coffee leaf weevil---abundant
 during April and May, feeding on the leaves, blossom buds,
 and newly set berries---one year life cycle---eggs in flat
 masses of fifty or more between two overlapped leaves, larvae
 ---feed on roots. Adults also on *Vitex divaricata*---a Chalcid
 (*Tetrastichus vaguitarum* Wolec.) bred from eggcluster.”

Wolcott 22a-16 to 19, 3 fig.: a more extended account, illustrations of eggs, parasite and adult.

Wolcott 23-46: possibility of control by spraying with Arsenate
 of Lead, but ordinarily not justified on account of expense.

EEP-53-55: an economic illustrated account.

EEWI-327 to 330, 451: mentioning the first record by: Quintanilla, Guillermo. “Enfermedad de los Cafetales en Adjuntas, la Plaga de la Vaquita”. La Reforma Agrícola, año 3, No. 12, pp. 217-224. San Juan, November 1896. also an illustrated account as a pest of coffee, and of citrus.

Danforth: at Quebradillas iv-29 det. Mutchler, Joyuda v-30, etc.

AMC: at Luquillo viii-30, vi-32, Arecibo viii-32, Yauco iii-33, vi-32, Mayagüez xii-33, vii-32, v-32.

feeding on tender orange leaves at Pueblo Viejo (149-15), of grapefruit at Isabela Grove, (Plantaje) Pt. Salinas (31-16), at Barceloneta (12-19); on leaves of coffee (44-21 TYPE, 499-21, 416-21 lived in captivity over fifty days, some of the females laying about 30 eggs each, which hatched in ten to fourteen days), at San Sebastián (99-21), in mountains north of Yauco (301-21), between Adjuntas and Utuado (91-22, 269-22), at Ciales (459-21); on chinaberry at Ponce (I No. 4843).



Lachnopus coffeae var. *montanus* Marshall. Six
 times natural size. (Drawn by G. N. Wolcott.)

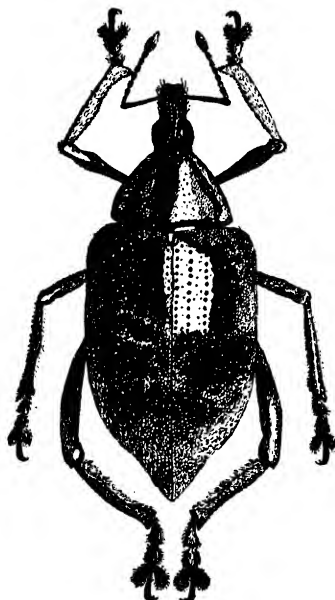
Lachnopus coffeae, var. *montanus* Marshall 22-61 to 62, fig. 1; TYPE of variety from mountains north of Yauco, Porto Rico: “This upland race differs from the typical coast form in being somewhat larger and having the legs markedly paler; the scales on the upper surface are much sparser and more evenly distributed, and they are also rather smaller and more nearly circular; most of them being very pale blue or bluish white;

on the other hand the stripe of white scaling along the side of the sternum is much denser and more sharply defined. There appears, however, to be no reliable structural difference either in the external characters or in the male genitalia."

Wolcott 22a-16, fig. 16: also at Adjuntas, illustration of adult showing white stripe of scaling along sternum.

Wolcott 23-46: mention.

feeding on tender leaves of coffee in mountains north of Yauco (146-21 TYPE, 161-23); between Adjuntas and Utuado (484-21, 91-22, 268-22), at Adjuntas (69-24), at Jájome Alto (30-24); feeding on leaves of *Cestrum macrophyllum* at Ciales (34-24).



Lachnopus curvipes F. Six times
natural size. (Drawn by
G. N. Wolcott.)

Lachnopus curvipes Fabricius

Stahl. Chevrolat 76-227. Gundlach. Leng & Mutchler.

Wolcott 22a-20, fig. 20: notes, illustration of adult.

(as sp.—also probably includes *L. coffeae*) Wetmore 16-58 to 128: eaten by Cuckoo, Ani, Owl, Kingbird, Petchary, Flycatcher, Mockingbird, Vireo, Parula Warbler, Honey Creeper, Yellow-Shouldered Blackbird, Oriole, Mozambique, Tanager, Spindalis, Grossbeak, Grasshopper Sparrow.

Wolcott 24-20, 30; eaten by *Anolis pulchellus* and *A. cristatellus*.

Wolcott 26-50: on sea-grape.

Danforth 31-81: eaten by P. R. Flycatcher.

Dexter 32-6: eaten by Surinam toad, *Bufo marinus*.

Wolcott 33-1172: females oviposit between paper.

EEWI-451: on citrus.

Danforth: at Ponce xi-27 det. Mutchler, Coamo ix-29, Mameyes xii-29, Florida xii-30, Jayuya xi-27, etc.

AMC: many records, at Yabucoa vi-30, Luquillo vi-32, etc.

on *Amaranthus spinosus* (168-16), at Ilares (I No. 2349); on undetermined weed at Dorado (718-13), at Vega Alta (173-15), at Barceloneta (146-15), at Arecibo (279-21), at Yauco (405A-14, 704-14, 315-21), at Guayanilla (402-21); on *Inga vera* at Comerío (756-13); on *Cordia cylindrostachya* at Yauco (521-13) and on *Croton* sp. at Yauco (42-22); on sea-grape, *Coccoloba uvifera* at Loíza (125-22); on *Dalbergia Ecastophyllum* at Algarrobo (196-22), at Palo Seco, April 7, 1931 (GNW); on *Waltheria americana* at Boquerón (19-23); on *Conocarpus erecta* at Pt. Salinas (53-23); eating calyx and hiding in cotton squares at Isabela (160-21, 216-21, 241-23), at Quebradillas (303-22), at Vega Baja (196-22); eating grapefruit leaves at Manatí (152-15), at Santana (211-16), at Vega Baja (496-16); eating leaves of *Cassia occidentalis* at Yabucoa Playa (287-23); on orange at Guayanilla (130-33); on grapefruit at Barceloneta (I No. 12, 2330), at Vega Baja (I No. 141), at Vega Alta (I No. 221), at Dorado (I No. 4177), at Manatí (I No. 4391); on cabbage (I No. 1273 Leonard 32-124); on swiss chard at Bayamón (I No. 5416); on watermelon at Arecibo (I No. 1213); on lima bean at Vega Baja (I No. 1643); on *Crotalaria* at Ponce (I No. 2663); on flowers of *Randia mitis* at Ponce (I No. 4436 as "near").

Lachnopus seini Wolcott sp. nov.

Integument piceous to black, legs and antennae purplish-pink; entirely and evenly clothed with very small convex, shiny, subcircular scales, with no constant areas of denudation. Length 6-8 mm.

on tender leaves of *Rapanea ferruginea* in mountains north of Yauco, F. Seín collector (263-Aug. 23, 1922 TYPE).

Lachnopus trilineatus Chevrolat 76-228: TYPE from P. R.

Gundlach. Leng & Mutchler.

Lachnopus valgus Fabricius

Gundlach.

Lachnopus yaucona Wolcott sp. nov.

Integument light brown to piceous, legs and antennae light yellow to reddish-brown; body and legs, except tarsi, evenly and densely clothed in light yellow, subcircular scales; punctures of elytra devoid of scales. Length 8 mm.

on tender leaves of *Rapanea ferruginea* in mountains north of Yauco, F. Seín collector (264-Aug. 23, 1933 TYPE).

Lachnopus sp.—det. L. L. Buchanan

on chinaberry at Yauco (I No. 5502); on various hosts at Guánica (I No. 5681, 5713).

Polydacrys ? sp. nov.—L. L. Buchanan

at Yauco (I No. 3616).

Apodrusus argentatus Wolecott, G. N., IP-130: TYPE from Pt. Cangrejos, P. R., feeding on *Dalbergia Ecastophyllum*.

Danforth: at Faro de Cabo Rojo iv-29 det. Mutchler, Tallaboa iv-31, Guayama iii-29, Boquerón iv-29, Mayagüez vii-32, etc.

feeding on leaves of *Guaiacum sanctum* at Guánica (703-14) and on *Colubrina colubrina* (EGS); on unidentified host at Aguirre (74-16); on *Dalbergia Ecastophyllum* in large numbers at Boquerón (20-23), at Pt. Cangrejos (389-22 TYPE), at Pt. Salinas (126-23), at Mameyes (214-23); on tamarind at Ponce (I No. 3086); on *Peirania* at Juana Díaz (I No. 4429); on "mabí" at Mayagüez (I No. 4736).

Apodrusus wolcottii Marshall 22-59, fig. 7, 1; TYPE from Porto Rico: "Integument black or piecous, fairly closely covered above with small, nearly circular, pinkish bluff scales having a distinct coppery sheen: the elytra with sometimes an indefinite narrow band of dark brown scales behind the middle between striae 3 and 6; the lower surface with coppery grey scaling along the sides of the sternum and venter, the median area with sparse short curved pale squamiform setae."

Wolecott 24-23: eaten by *Anolis krugii*.

abundant feeding on *Inga vera* leaves (87-21 TYPE), at Cayey (284-23); resting on coffee leaves at Añasco (369-12), in the mountains north of Yauco (302-21), at Jájome Alto (372-21), at Maricao (389-21), at Manatí (GNW); on *Inga laurina* flowers at Adjuntas (I No. 387); on vanilla at Adjuntas (I No. 2523 Leonard 33-129).

Heilipus usutulatus Olivier

Leng & Mutchler.

Hylobius pales Boheman—det. E. A. Chapin

in room at San Juan (I No. 951).

Phyllotrox sp.

Wetmore 16-111: eaten by "Reinita" or Honey Creeper, *Coebea portoricensis*.

Derelomus albidus Suffrian

Gundlach.

Neomastix sp.—det. L. L. Buchanan

on flowers of *Inga laurina* at Adjuntas (I No. 3888), of *Guazuma* at Ponce (I No. 4458).

Tychius sp.

Wetmore 16-87: eaten by P. R. Cliff Swallow

Otidocephalus pulicarius Boheman

Leng & Mutchler.

on *Pilea tenerrima* at Adjuntas (I No. 2693); on guava at Arecibo (I No. 5441); resting on pomarrosa at Arecibo (I No. 2392—"app. new sp.").

Erodiscus sp.

Wetmore 16-39: eaten by Antillean Killdeer.

Catapastus sp.—det. L. L. Buchanan

on pomarrosa at Ponce (I No. 4446); another sp. on *Senegalia* flowers at Ponce (I No. 4447, 4465).

Smicronyx sp.—det. L. L. Buchanan

on pomarrosa at Ponce (I No. 5756); on *Inga laurina* flowers at Ponce (I No. 14461).

Micromimus sp.—det. L. L. Buchanan

in rotten wood at Aibonito (I No. 5649).

Sibinia sp.—det. L. L. Buchanan

on flowers of *Randia mnis* at Ponce (I No. 4441); another sp. on *Senegalia* flowers at Ponce (I No. 4445).

Phyllotrox sp.—det. L. L. Buchanan

on flowers of *Inga laurina* at Adjuntas (I No. 3889), of ? at Yauco (I No. 5768).

Ulosomus sp.

on dead wood at Yauco (I No. 5934), on *Areca catechu* at Ponce (I No. 4134, 4835, 4836).

Anthonomus annulipes Fisher 88-487: TYPE from P. R.

Gundlach. Leng & Mutchler.

Anthonomus dentipennis Chevrolat 76-228: TYPE from P. R.

Gundlach, with *A. krugii* Fisher in synonymy.

Leng & Mutchler.

Danforth: at Boquerón iv-29 ? det. Mutchler.

Anthonomus flavipes Boheman (TYPE from Guadeloupe) det. L. L. Buchanan

reared from fruit of *Malpighia glabra* at Mayagüez (I No. 4564).

Anthonomus nigrovariegatus Fisher 88-487: TYPE from P. R.

Gundlach. Leng & Mutchler.

Anthonomus pulicarius Boheman: TYPE from P. R.

Leng & Mutchler.

(as sp.) Wetmore 16-84: eaten by Wood Pewee.

Van Zwaluwenburg 16-45: as "a very small, dark, long-snouted weevil in the flower buds of eggplant," notes and control.

Cotton 18-300: "Eggplant Bud weevil----feeds on leaves and breeds in the flower buds. Eggs----laid in young developing buds and the small white legless larvae develop within the bud, causing it to dry up and drop off."

EEP-105: as a pest of eggplant.

EEWI-594: quoting Cotton's account.

Danforth: at Mayagüez xi-30 det. Mutchler.

on wild eggplant. *Solanum torvum*, (403-17), at Cayey (258-21), at Villalba (I No. 4370), at Bayamón (I No. 2450, 5327, 5327-B); on eggplant at Peñuelas (I No. 2817): species a.

Anthonomus sp. b.

at Juana Díaz (I No. 4130); on *Eugenia* sp. at Aibonito (I No. 4804).

Anthonomus sp. c.

on *Colubrina* sp. at Paraguera (I No. 4735).

Anthonomus costulatus Suffrian = irroratus Dietz—det. L. L. Buchanan

on guava at Adjuntas (I No. 2526 Leonard 33-117), at Aibonito (I No. 4352), at Río Piedras (I No. 2653): species d.

Anthonomus sp. e.

on mangrove seed at San Juan (I No. 1669).

Anthonomus sp. f.

at Ponce, Jan. 12, 1933.

Anthonomus sp. g.

at Adjuntas (I No. 4305).

Anthonomus sp. h.

at Aibonito (I No. 4759).

Anthonomus sp. i.

on mangrove leaves at Ponce (I No. 4707).

Anthonomus sp. j.

on *Peiraisia* at Ponce (I No. 4442); on *Inga laurina* at Adjuntas, March 24, 1933, Oakley.

Anthonomus sp. k.

at Ponce (I No. 5800).

Anthonomus sp. l.

in *Malpighia glabra* fruits at Mayagüez (I No. 2544, 4564); on "húcar" leaves at Ponce (I No. 440); on *Furamea occidentalis* at Ponce, July 17, 1934, Oakley.

Anthonomus sp. m.

on *Inga laurina* at Juana Díaz, April 10, 1933, Oakley; on *Furamea occidentalis* at Ponce, July 17, 1934, Oakley.

Anthonomus sp. n.

on "húcar" at Ponce (I No. 4446).

Anthonomus sp. o.

on pomarrosa flowers at Aibonito (I No. 4448).

Anthonomus sp. p.

on guava at Ponce (I No. 4748).

Anthonomus sp. q.

on pomarrosa flowers at Ponce (I No. 4449); on mangrove at Ponce (I No. 4709).

Anthonomus sp. r.

at Yauco (I No. 5766).

Anthonomus sp. s.

on *Eugenia* sp. flowers at Aibonito (I No. 4377), at Ciales (I No. 5476); on pomarrosa at Aibonito, Aug. 3, 1933, Oakley.

Anthonomus sp. t.

on *Guazuma Guazuma* flowers at Ponce (I No. 4457).

Piarzorrhinus sp.—det. L. L. Buchanan

on *Trophis racemosa* at Ponce (I No. 4450); on ? at Yauco (I No. 5640).

Pseudamopsis sp.—det. L. L. Buchanan

on *Coccolobis laurifolia* at Yauco (I No. 4844); at Ponce (I No. 4452, 4454).

Pyropus sp. (not *sapphirinus* Gyllenhal of Cuba)—det. L. L. Buchanan

at Ponce (I No. 4604), at Aibonito (I No. 4765, 5602).

Centrinus sp.—det. L. L. Buchanan

at Villalba (I No. 5151).



Peridinetus concentricus Olivier.
Six times natural size. (Drawn
by G. N. Wolcott.)

Peridinetus concentricus Olivier

Chevrolat 76-229.

(as *P. signatus* Schönherr) Stahl. Gundlach, with *concentricus* in synonymy, and as *P. maculatus* Sturm, not in synonymy.

(and as *signatus* Rosenschoeld. not in synonymy) Leng & Mutchler.

(as *P. poeyi* Jacq. Duval) Leng & Mutchler 17-217. AMNH at Mayagüez.

(as *P. signatus* Rosen.) Van Z. (P. R. 36) on *Piper peltata*. Wolcott 22a-8, fig. 2: "el picudo del higuillo que al comer hace agujeros circulares en las hojas"; illustration of adult. Danforth: at Utuado xii-30 det. Mutchler, Jayuya viii-30, Maricao iii-29, 1-32.

AMC: at Utuado xii-30, Barranquitas x-34.

on *Piper peltatum*, "more abundant on *Piper medium*, make small round holes in leaves, larvae bore in stems of plants" at Vega Alta (40-17 R. T. Cotton); on *Piper medium* at Espinosa (104-21), at Corozal (456-21), at Loíza (119-22), at Cayey (286-22).

Zygobaris sp. nov.—det. L. L. Buchanan

on *Matayba* at Ponce (I No. 4456, 5799).

Rhaptinus (Baris) torquatus Olivier A. G., (as **Rhynchaenus**) "Entomologie" V. Paris, 1807, (83), p. 145: TYPE from P. R.

(as *Baridius*) Stahl.

Chevrolat 76-229. Gundlach.

Leng & Mutchler. AMNH at San Juan and Mayagüez.

Wetmore 16-87, 119: eaten by Cliff Swallow and Mozambique.

Van Zwaluwenburg 16-43: notes and control.

Cotton 18-300: "Eggplant Stem Borer.----a pest of both wild and cultivated eggplant. Adult feeds on foliage, larva bores in stem and branches.----small, white, oval eggs in a crecentric slit in the stem." Wolcott 22a-8: mention.

EEP-105: as a pest of eggplant.

Wolcott 24-30: eaten by *Anolis cristatulus*.

EEWI-591: quoting Cotton's account.

Danforth: at Aibonito vi-34, Mayagüez on many dates.

AMC: thirty records, at Luquillo vi-32, Yabucoa vi-30, Fajardo xii-33, Ponce i-32. Barros i-32, Maricao xii-33, Salinas xii-33, etc.

resting on bean (I No. 1350 Leonard 32-133), (I No. 889); on *Solanum indicum* at Mayagüez (I No. 3240); in grapefruit grove at Las Marías (I No. 2304; on eggplant or *Solanum torvum* (349-12, 731-13, 169-16, 449-16, 504-16, 405-17, 77-21), at Arecibo (441-13), at Guánica (525-13), at Yauco (I No. 2664), at Aibonito (SSC), at La Plata (68-12), at Juncos (RTC), at Peñuelas (I No. 2816), at Consumo (I No. 1469).

Diorymerellus obliteratus Champion—det. Guy A. K. Marshall

in flower bracts of orchids, *Haberaria*, on El Yunque (45-24); on vanilla at Adjuntas (I No. 2523-B as "near").

Ampelogypter cissi Marshall 22-70, pl. 1, fig. 6, TYPE from Porto Rico: "Color uniform dark steel-blue above, the head, rostrum and lower surface blue-black. Length 2 mm." feeding on tender shoots of *Cissus sicyoides* (161-21 TYPE).

Sternechus sp.—L. L. Buchanan on *Cascaría* at Ponce (I No. 4460).

Lecriops psidii Marshall 22-69, fig. 4, pl. 1, TYPE from Porto Rico: "Integument red-brown; the head with a dense edging of pale buff scales between and behind the eyes; the prothorax clothed with rather sparse narrow brownish-yellow scales,---- the median stripe of dense broad white scales on the posterior half,----the elytra fairly densely covered with mingled pale buff and whitish scales, with an ill-defined curved dark transverse band about the middle----; the mesosternum, metasternum and abdomen uniformly covered with large subcontiguous white scales. Length 2 mm.; breadth .9 mm."

EEW1-519: apparently a serious pest of guava.

(? 402-76), at Mayagüez (R. H. Van Zwaluwenburg, collector and "H. 1219-- bred from mummied guava") (710-14 TYPE) from *Psidium guajava*, at Bayamón (I No. 1790, Leonard 33-116), at Aibonito (I No. 3024), at Arecibo (I No. 1870).

Hypurus near *bertrandi* Perris—det. L. L. Buchanan larvae mining in leaves of *Portulaca* (482-12 as *Hypo-coeliodes* sp. nov.—det. E. A. Schwarz); in seed pods of weed at Ponce (I No. 3792).

Copturus sp.—det. L. L. Buchanan in dead bark at Guánica (I No. 5712).

Auleutes inspersus Champion—det. Guy A. K. Marshall Danforth: at Mayagüez ix-32 from *Jussiaea* det. Marshall, ii-27, Cartagena Lagoon iii-27, Caguas xii-29, Las Marías iii-27. (as "sp." "near *cubanus* Voss" "*Auletobius*") det. L. L. Buchanan on milkweed flowers at Bayamón (I No. 5543); on flowers of *Inga laurina* at Adjuntas (I No. 3871), at Ponce (I No. 5933); on leaves of *Scirpus validus* and ? at Juana Díaz (I No. 4437, 4701).

Ryssenatus sp. Wetmore 16-57, 59, 61: eaten by Cuckoos and Ani. on *Peirania* at Ponce (I No. 4609).

Chalcodermus ebeninus Boheman

Van Z. (1513) on cowpeas.

(as sp.) Wetmore 16-119: eaten by Mozambique.

EEP-117: on cowpeas.

on cowpeas (70-12, 377-12 det. Schwarz, 76-21); on cane at Arecibo (EGS); on guava (I No. 2993); on vegetables (I No. 64).

Chalcodermus pupillatus Suffrian

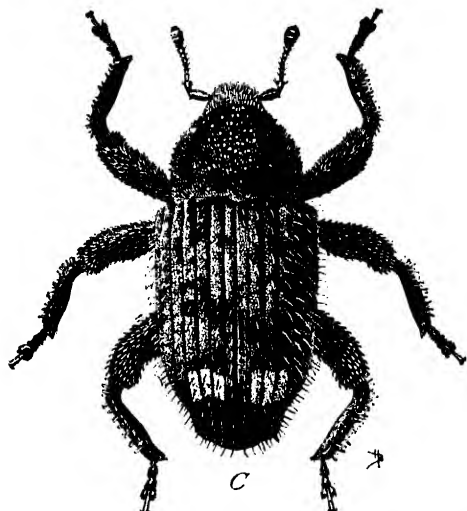
Wetmore 16-119: eaten by Mozambique.

Danforth 23-82: eaten by P. R. Pewee.

Danforth: at Mayagüez iii-29 det. Mutehler. Yaueo xi-28, Boquerón iv-29, Cabo Rojo xii-32, Cartagena Lagoon iv-31.

Chalcodermus sp.—det. L. L. Buchanan

on cotton at Ponce (I No. 4051).



Euscepes batatae Waterhouse. Fourteen times natural size. (Drawn by H. Bradford.)

Euscepes batatae Waterhouse The "Searabee" of Sweet Potatoes.

Van Z. (926) on sweet potatoes and pomelo rind.

Van Zwaluwenburg 15-35: notes and control.

Cotton 18-309: a short account.

Wolecott 22a-7, fig. 5: notes, control and figure of adult.

Pierce, W. Dwight. "Weevils which affect Irish Potato, Sweet Potato and Yam." Jour. Agr. Research, Vol. 12, No. 9, pp. 601-611, pl. 7. Washington, D. C., March 4, 1918: on p. 608, "Mayagüez, Porto Rico, injured sweet potatoes, 1912, 1914, 1917, Mr. C. W. Hooker, Mr. R. H. Van Zwaluwenburg".

Sasscer, E. R., "Important Insects collected on Imported Nursery Stock in 1920". Jour. Ec. Ent., Vol. 14, No. 4, p. 354. 1921: "The West Indian Sweet Potato Weevil (*Euscepes batatae* Waterhouse) arrived in tubers from Porto Rico."

Marlatt, C. L., "Report (1927-28) of the Federal Horticultural Board". U. S. Dept. Agr., pp. 42. Washington, D. C., 1928: intercepted in sweet potatoes from P. R.

Montgomery, J. H., and Bragdon, K. E., "Quarantine Department". Quarterly Bul. Fla. State Plant Board, Vol. 3, No. 2, pp. 110-112. Gainesville, 1919: intercepted in sweet potatoes from P. R.

Dexter 32-5: eaten by Surinam toad, *Bufo marinus*.

Wolcott 33-266 & EEWI-652: limited distribution in P. R.

Leonard 32-137: at Mayagüez.

Danforth: at Mayagüez x-30 det. Mutchler, Arecibo v-29.

AMC: at Mayagüez v-33, x-31, Yauco ii-31, Río Piedras xi-31. in sweet potatoes (142-16, 9-34, I No. 1506 Leonard 33-123, and at Guayanilla). at Mayagüez (777-14).

Euscepes porcellus Boheman, Carl H., in Schonherr's "Genera et Sp. Curculionidum" Vol. 4, pt. 1, Paris, 1844, p. 430: TYPE from P. R.

Leng & Mutchler. Leng & Mutchler 17-217: "redescribed by Leconte under the name *Acalles longulus* (Champion, Biol. Cent. Amer., Col., IV, pt. 4, p. 496)."

Wetmore 16-87 to 128: eaten by Cliff Swallow, Vireo, Redstart, Ovenbird, three Warblers, Honey Creeper, Yellow-Shouldered Blackbird, Oriole, Mozambique, Grasshopper Sparrow. probably this species: on *Psidium guajava* (281-12); on *Andira inermis* at Larcs (53-22).

Conotrachelus sp.—det. L. L. Buchanan
on *Ocotea* fruit at Adjuntas (I No. 3883).

Tyloderma sp.—the Sesban Weevil

Danforth 26-70 to 117: eaten by Pectoral and Semipalmated Sandpipers, W. I. Kildeer, Ani, Kingbird, Yellow-Shouldered Blackbird, Northern Waterthrush, Northern Parula Warbler.

Pseudomus militaris Olivier, A. G., (as **Rhynchaenus**) "Entomologie". V, No. 83, p. 145. Paris, 1807: TYPE from P. R.

Pseudomus sp.—det. L. L. Buchanan

on areca palm at Ponce (I No. 4841); on betel palm at Adjuntas (I No. 4798); in decaying palm at Villalba (I No. 5690); on dead wood at Yauco (I No. 5610), at Guayanilla (I No. 5479); on pomarrosa at Villalba (I No. 4802).

Cryptorhynchus spp. (or allied genera)

under bark of *Inga vera* in hills back of Río Piedras (48-33 "near *levidipus* Boheman from R. D." GNW); on branch of *Inga laurina* at Adjuntas (I No. 3990); on coffee at Adjuntas (I No. 4313); on areca palm at Villalba (I No. 4831, 4832); on moca at Peñuelas (I No. 4372); on *Inga vera* at Aibonito (I No. 4360).

Coelosternus sulcatus Boheman—det. Guy A. K. Marshall

Leonard, M. D., "A Little-Known Root-Weevil of Cassava. (*Coelosternus sulcatus* Boheman)." Jour. Dept. Agr. P. R.,

Vol. 14, No. 3, pp. 159-163, fig. 1, pl. 3. San Juan, August 1930: at Comerío.

Leonard 31-117: mention. EEWI-658: mention.

presumably this insect on cassava at Río Piedras (E. Moli-nary Sales) three plants infested.

Gatrocercus ritcheri Fischer

Leng & Mutchler.

Anchonus angulicollis Chevrolat 76-228: TYPE from P. R.

Gundlach. Leng & Mutchler.

possibly this species: punctures on elytra alternating with elongated warts with erect reddish-brown elongate scales, pro-thorax, beak and legs consisting entirely of punctures: under loose bark of *Inga vera* at Cayey (364-22).

Anchonus suillus Fabricius

Gundlach. Marshall 22-62, fig. 3, pl. 1: note.

Wolcott 24-30: eaten by *Anolis cristatellus*.

Dexter 32-6: eaten by Surinam toad, *Bufo marinus*.

Danforth: at Aibonito vi-30 det. Mutchler, Mayagüez ix-30 det. Mutchler, Ensenada iv-31, Morovis xii-32, La Tortuguera iv-27, etc.

from decayed wood of castor bean, *Ricinus communis*, (232-21); from board on ground (368-21, 64-33), at Guánica (614-14): from decayed fence post at Naguabo (34-10); at Mayagüez (R. H. Van Z.); eaten by lizard, *Anolis cristatellus* (296-23); under *Cosmopolites* banana traps (296-23).

Anchonus sp.—det. L. L. Buchanan

reared from decaying wood at Ponce (I No. 5201, 5201-B, 5204).

Cossonus canaliculatus Fabricius

Leng & Mutchler.

Cossonus impressus Boheman

Leng & Mutchler 17-218: from Mona Island.

Danforth: at Aibonito vi-34.

in rotten wood at Aibonito (I No. 5650), at Ponce (I No. 4453).

Cossonus vulneratus Illiger

Leng & Mutchler.

Dryophthorus sp.—det. L. L. Buchanan

in decaying wood at Yauco (I No. 5199).

Caulophilus lantinasus Say

Chittenden, F. H., "The Broad-Nosed Grain Weevil" Bur. Ent. Bul. 96, pt. 2, March 31, 1911, pp. 19-24: "February 3, 1899, living beetles were found in about equal numbers with the rice weevil in shelled corn and chick-peas (garbanzos) pur-chased in a store by Mr. August Busck at Arroyo, Porto Rico."

Wetmore 16-111): eaten by Honey Creeper.

Cotton, R. T., "Broad-Nosed Grain Weevil". U. S. Dept. Agr. Bull. No. 1085, pp. 10, pl. 1. Washington, D. C., 1922: recorded from P. R.

Caulophilus sp.

Wetmore 16-73, 75, 87, 89, 111: eaten by a Flycatcher, Black Swift, Cliff Swallow. Martin and Honey Creeper.

one adult, black but all of elytra reddish-brown; under bark of dead *Bursera simaruba* tree at Vega Baja (114-16); another with only basal third of elytra reddish-brown; on leaves of *Inga vera* at Cayey (317-17).

Nanus uniformis Boheman (in Schönherr)

Gundlach, "Se encuentra frecuentemente en la parte interior de una llagua de Palma real fresca". Leng & Mutchler. in pollen of royal palm at Ponce (F No. 4961).

Metamasius hemipterus Linnaeus The Rotten Stalk Borer of Sugar Cane.

(as *Sphenophorus sericeus* Latr.) Stahl. Gundlach, "en los troncos muertos de plátano (*Musa*)."

(as *Sphenophorus scutellatus* Drury) Busek 00-89: injuring sugar cane.

Leng & Mutchler.

Van Z. (305) in sugar cane, coconut palm and *Lantana* sp.

Van Dine 11-55; Van Dine 12-22; Van Dine 13-256; Van Dine 13-33: injurious to sugar cane, but not a serious pest.

Wetmore 16-10: the adults constituted 5.44% of the stomach contents of the Mozambique. 5.3% of the Kingbird, 1.53% of the Petchary, and had been eaten by the Ani, Oriole and Yellow-Shouldered Blackbird.

Stevenson 18-22: attacked by the Green Muscardine fungus.

Smyth 19-142: "sugar cane; dead or injured palm trunks; banana trunks (rarely). Adults sometimes attack fruit."

Wolcott 21-46: attacking injured cane, eggs very rarely laid in injury as small as *Diatraea* tunnel, usually in rat injured cane.

Wolcott 22-48; Wolcott 23-49: larvae in stems of live banana (at Jájome Alto).

Wolcott 22a-10, fig. 7: a short account and illustration of adult. EEP-36: "El Gorgojo de la Caña Podrida."

Danforth 26-90: eaten by Ani.

Colón 31-123: abundant under *Cosmopolites* banana corm traps at Carite.

Leonard 32-121: on bananas.

Dexter 32-5: eaten by Surinam toad, *Bufo marinus*.

EEWI-199 to 200: an extended account.

Danforth: Ciales-Villalba Road xi-27, Adjuntas xi-28, etc.

AMC: forty records, at Cartagena Lagoon iv-29. Mt. Montoso ix-32. Maricao xii-30, Yabueca vi-30, etc.

larvae, pupae and adults in or on sugar cane (23-11, 24-11, 61-11, 163-11, 164-11, 199-11, 133-12, 282-12, 350-12, 393-12, 166-13, 794-13), at Luquillo (191-13, 238-13), at Fajardo (39-15), at Naguabo (27-14), at Patillas (167-12), at Santa Isabel (33-15), at Ponce (166-12), at Guánica (12-10, 519-13, 328-15, 363-15, 364-15, 367-15), at Arecibo (309-13), at Barceloneta (39-10), at Manatí (904-14), at Vega Alta (60-10), at Cayey (24-21); in rotting stem of royal palm tree at Arecibo (1066-16); on El Duque at Naguabo, 1600 ft. up (721-14), at Aibonito (SSC); larvae in standing banana stalk at Jájome Alto (31-21); adults in injured banana corms at Aibonito (44-25); under *Cosmopolites* banana corm traps (216-23); adults in rotten mamey fruit, in rotten papaya fruit, in rotten maga fruit at Isabela (114-32); feeding on mango fruit on the ground at Añasco (I No. 2109); feeding in decaying squash at Vega Baja (I No. 3592); in cassava stem at Lares (I No. 2718); in cane ear at Manatí (I No. 1033); in packing house at Barceloneta (I No. 1138), at Bayamón (I No. 2801); on mangrove at Ponce (I No. 4703); in plantains (I No. 960 as *M. sericeus* Olivier det. E. A. Chapin); in decaying guava fruit at Bayamón (I No. 482); under pineapple plant at Bayamón (I No. 5443).

***Cosmopolites sordidus* Germar The Banana Corm Weevil**

Wolcott 22a-11, fig. 8: and Wolcott 23-49: discovery, early distribution in P. R., life-history and methods of control.

González Ríos, Policarpo, "El Gorgojo de Banano". Rev. Agr. P. R., Vol. 9, No. 6, pp. 39-42. San Juan, 1922.

Wolcott 24-97 and 24-55: the effectiveness of continued collection of adults from under traps: slices of banana corm.

Wolcott 24-6, 30: no parasites known, eaten by *Anolis cristatellus*.

EEP-59: an economic account.

Torres, Ignacio L., "El Gorgojo del Ñame del Guineo. (*Cosmopolites sordidus*)". Rev. Agr. P. R., Vol. 19, No. 2, pp. 56-58, fig. 2. San Juan, 1927.

Rivera, Eugenio M., "Informe sobre el Trabajo de Estudios del Gorgojo del Ñame del Banano por el Personal de Campo Destacado en Utuado, Adjuntas y Jayuya". Rev. Agr. P. R., Vol. 19, No. 2, pp. 59-62. San Juan, 1927.

López Domínguez 27-48: spread to Utuado.

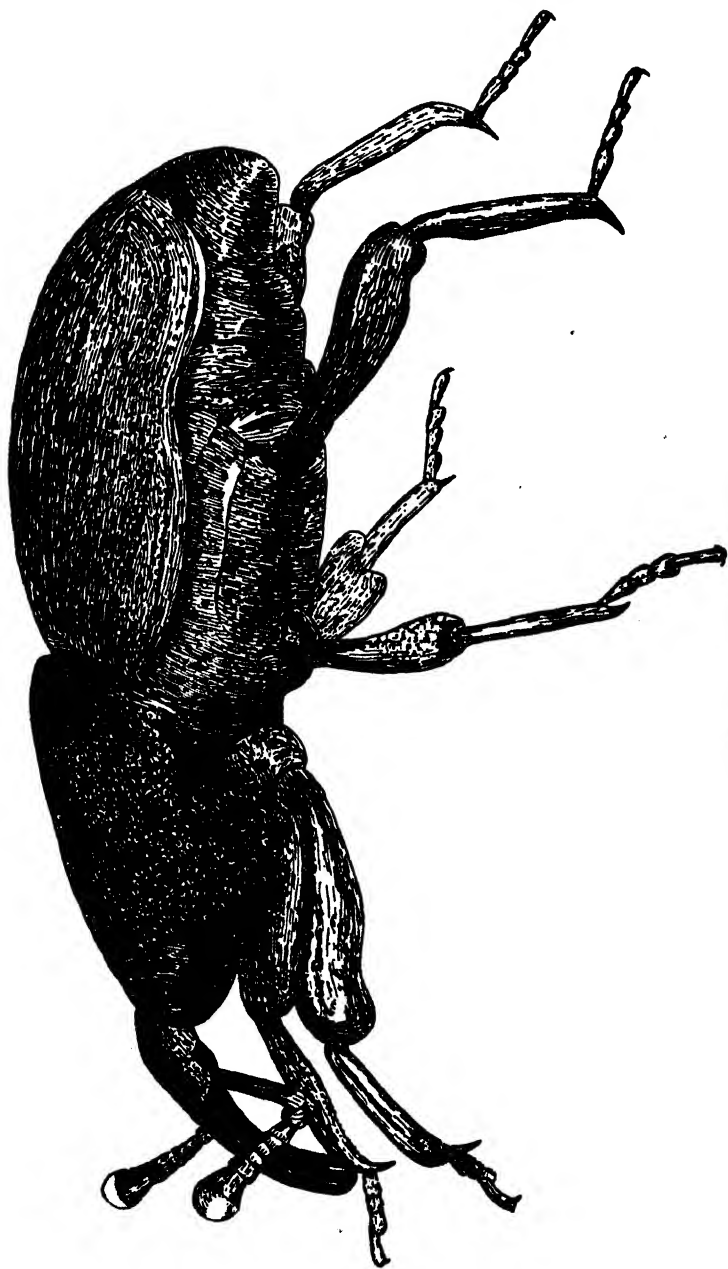
Seín 29-95: first use of pared corms at Utuado.

Javiere, Clemente, "Enfermedades y Plagas que atacan al Plátano". Bol. Agr. P. R. No. 30, p. 3. San Juan, March 5, 1932.

Dexter 32-8: eaten by Surinam toad, *Bufo marinus*.

Faxon & Trotter 32-447: mention.

Leonard 31-121: experiments and plans.



Cosmopolites sordidus Germar.
Twelve times natural size. (Drawn by F. Sehn.)

Leonard, M. D., "A Bibliography of the Banana Root Weevil". Jour. Dept. Agr. P. R., Vol. 15. No. 2, pp. 147-176. San Juan, 1931.

Leonard 32-121: survey and distribution in Ponce, Guayanilla, Peñuelas.

Seín, F., "El Gorgojo del Ñame del Guineo en Puerto Rico". El Mundo, p. 15, fig. 4. San Juan, October 6, 1929.

Wolcott 33-266: in P. R. in 1921.

EEWI-485: an economic account.

Wolcott 34-102: a summary of Seín's experiments.

Seín, F., "Paring and Heat Sterilization of the Corms to Eliminate the Banana Root Weevil". Jour. Agr. Univ. P. R., Vol. 18, No. 3, pp. 411-416, pl. 1, fig. 2, ref. 2. San Juan, October 27, 1934.

Seín, F., "Para Combatir el Gorgojo del Plátano—Método de Mondar la Semilla". Circ. No. 103, Est. Expt. Agrícola, Río Piedras, P. R., pp. 5-11, pl. 1, fig. 2. San Juan, November 24, 1934: the effectiveness of the method of control discovered by Mr. Seín had been proved and adopted by numerous growers in P. R. before this public announcement.

AMC: in 1927 at Ciales; common in 1930 at Mayagüez, Coamo, Yauco, Cabo Rojo, Utuado, Barros, Barranquitas.

one larva from banana at Vega Alta, barrio Malvilla (439-21 the first record in Porto Rico. 628-21 determination confirmed by Dr. Marshall and R. T. Cotton, 547-22), at Corozal (491-21), at Cupey (182-22) and at the Experiment Station (173-22) Río Piedras, at Comerío (275-22), at Aguas Buenas (246-23), at Barros (10-26), at Toa Baja (59-23), at Manatí (25-25), at Morovis and Ciales (24-25), at Utuado (9-26), at light at Isabela (116-31); at Ponce (I No. 2525), at Adjuntas (I No. 4251).

Calendra (Calandra) linearis Herbst

(as sp.) Wetmore 16-66: eaten by P. R. Tody, *Todus mexicanus*.

(as *Sitophilus*) Gundlach, "Come las semillas del tamarindo".

Wolcott 24-30: eaten by *Anolis cristatellus*.

in tamarind seed pods (I No. 1985 Leonard 33-127), at Guánica (535-13, 543-14), at Loiza (345-21), at Cabo Rojo (I No. 309), at Ponce (I No. 961), at Río Piedras (I No. 332).

Calendra (Calandra) oryzae Linnaeus

(as *Sitophilus*) Stahl. Gundlach, "muy dañina por la destrucción de los granos del maíz".

Barrett 05-396: parasitized by *Pteromalus calandrae* Howard. Leng & Mutchler.

Leng & Mutchler 17-218: from Mona Island.

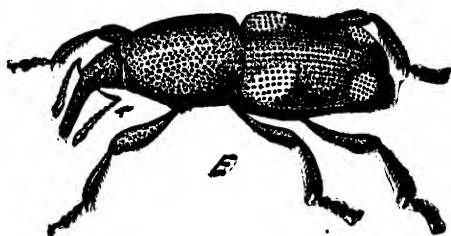
Van Z. (1501) in stored corn, beans, sweet potatoes.

Wetmore 16-96: eaten by Latimer's Vireo.

Wolcott 22a-9, fig. 6, and Wolcott 22b-6: notes, life history and control.

EEP-127: an economic account.

(I No. 988. 5020), in rice (26-11), in corn (487-12, 434-17, 612-17), at Ponce (I No. 2520, 3729), at Guánica (615-14) and on foliage of casuarina tree (411-14); under bark of *Erythrina glauca* tree at Cayey (316-17); in mamey seed at Isabela (165-32 det. R. T. Cotton); in flowers of *Corchorus hirsuta* at Pt. Cangrejos (230-23); in dry chick peas (I No. 2880); in tomato fruit (I No. 3701); in ñame root at San Juan (I No. 5048, 5230); in herbs at Carolina (I No. 2212 det. as *Sitophilus*), at Utuado (I No. 2236).



Calendra oryzae L. Ten times natural size.
(After Cotton.)

Sphenophorus pertinax Olivier—det. GNW
on the ground at Carolina (15-24).

Sphenophorus venustus Say?

(as *S. venatus*) Dexter 32-5: eaten by Surinam toad, *Bufo marinus*.

Danforth: at Mayagüez viii-30 det. Mutchler, iii-29, Maricao xii-30.

PLATYPOIDÆ

Platypus excisus Chapuis—det. M. W. Blackman
from *Inga vera* at Aibonito (326-23).

Platypus poeyi Guérin

Gundlach, "Talandra la madera en dirección de la corteza al corazón".

Platypus near **porrectus** Chapuis—det. M. W. Blackman
at light at Mayagüez (I No. 2422).

Platypus ratzenburgi Chapuis—det. A. D. Hopkins

Wolcott 24-15, 26, 33: eaten by *Anolis evermanni*, *A. stratulus* and *A. gundlachi*.

under bark of logs of *Inga vera* at Lares (133-21), of *Inga laurina* at Ciales (314-23).

Platypus rugulosus Chapuis—det. A. D. Hopkins

at light at Mameyes (184-13), at Mayagüez (I No. 2320-B Leonard 33-134); in grapefruit grove at Barceloneta (I No. 3658); on *Inga vera* flowers at Aibonito (I No. 4773).

Platypus schaumii Chapuis, F. "Monograph des Platypides". Mem. de la Soc. Royale des Sci. Liege, Vol. 20. p. 81, 1866: TYPE from P. R.

Leng & Mutchler.

Platypus subcostatus Jacq Duval

Gundlach. Leng & Mutchler.

Platypus spp.

Wetmore 16-63, 66, 73, 75, 84, 87, 108, 111: eaten by Woodpecker, Tody, a Flycatcher, *Anthracothonax aurulentus* (7.77% of stomach contents), Black Swift, Wood Pewee (8.86%), Cliff Swallow (41.% of stomach contents), Parula and Black & White Warblers, Honey Creeper (1.55%).

Danforth 26-116: eaten by P. R. Honey Creeper.

SCOLYTIDÆ

Hexacolus sp. nov. det. M. W. Blackman

in dead tree at Matrullas Dam (I No. 5842).

Stephanoderes brazilensis Hopkins—det. M. W. Blackman

from decayed flower-stalk of banana at Bayamón (I No. 2423 Leonard 33-131); from orange fruit at Ponce (I No. 3877); from almendra fruit at San Germán (I No. 5724); from dry guava fruit at Corozal (I No. 1633 as "near").

Stephanoderes near **brunneus** Hopkins—det. M. W. Blackman

in mangrove seed balls at Ponce (I No. 5207).

Stephanoderes buscki Hopkins—det. M. W. Blackman

in pods of algarrobo, *Hymenaea courbaril*, at Arecibo (I No. 1988), at Ponce (I No. 5905 as "near"); in tamarind pods at Ponce (I No. 3194); in guava fruit at Peñuelas (I No. 3051).

Stephanoderes georgiae Hopkins—det. M. W. Blackman

in guava fruit at Peñuelas (I No. 3051).

Stephanoderes near **guatemalensis** Hopkins—det. M. W. Blackman

in decaying papaya fruit at Arecibo (I No. 5110).

Stephanoderes opacifrons Hopkins

Leng & Mutchler.

Stephanoderes near **texanus** Hopkins—det. M. W. Blackman

on citron at Palo Seco (I No. 2253).

Stephanoderes spp.

Wolcott 24-17, 26, 30: eaten by *Anolis pulchellus*, *A. stratulus* and *A. cristatellus*.

reared from under bark of silver oak (283-23, 294-23 det. A. D. Hopkins); on jagua fruit at Arecibo (I No. 1573); in tamarind pod at Aguadilla (I No. 2230); in dead wood at Adjuntas (I No. 5495, 5498).

Hypothenemus sp. near **parvus** Hopkins—det. M. W. Blackman
in dry pigeon peas (I No. 1174 Leonard 32–136); in tobacco
leaf at Loíza (I No. 5138-B); in orange fruit at Ponce (I No.
3878); in maga fruit at Vega Alta (I No. 5253).

Coccotrypes bassiaevorus Hopkins—det. M. W. Blackman
in orange fruit at Ponce (I No. 3730).

Anisandrus sp.—det. M. W. Blackman
a male on dead wood at Guayanilla (I No. 5483).

Dendrosinus bourreriae Schwarz—det. M. W. Blackman
on dead wood at Guayanilla (I No. 5485).

allied with **Pseudothysantes** Blackman
on dead wood at Yauco (I No. 5496).

Xyleborus affinis Eichhoff
Leng & Mutchler. EEWI-373: from dying coconut palms.
Danforth: at Mayagüez xi-31 det. Blackman.
“I regard *Xyleborus sacchari* Hopkins as no more than a variety
of *X. affinis* at best, and in a long series of so-called *sacchari*,
typical *affinis* appear usually to be present.” M. W. Black-
man, April 1935.
from *Inga vera* at Aibonito (347–23 det. Blackman), at
Juana Díaz (44–34 det. Blackman); from dying coconut palm
at Loíza (38–35 det. Blackman); at light at Mayagüez (I No.
2422 Leonard 33–132); on orange fruit at Ponce (I No.
5497); from dry *Crotalaria* pods (I No. 1180).

Xyleborus ampicollis Eichhoff
Leng & Mutchler.

Xyleborus near **bispinatus** Eichhoff—det. M. W. Blackman
in orange fruit at Ponce (I No. 1134).

Xyleborus confusus Eichhoff
Leng & Mutchler.
Danforth: at San Germán.
(I No. 4830); abundant under bark of dead bucare tree,
Erythrina glauca, at Cayey (349–22 det. A. D. Hopkins);
from coconut palm at Cabo Rojo (49–23 det. A. D. Hopkins),
at San Lorenzo (10–21), at Camuy (16–26), at Loíza (38–35
det. Blackman); in orange fruit at Aguadilla (I No. 1112).

Xyleborus ferrugineus Fabricius
Gundlach, “viene por la noche a las luces de las casas”.

Xyleborus grenadensis Hopkins
Leng & Mutchler 17–220.

Xyleborus inermis Eichhoff
Van Z. (P. R. 810).
Wetmore 16–87, 111: eaten by Cliff Swallow and Honey Creeper.
in mango (I No. 1040 det. Blackman).

Xyleborus sacchari Hopkins

(as sp.) Van Dine 11-56; Van Dine 12-22; Van Dine 13-256;
Van Dine 13-33; Smyth 19-142: all stages in rotten or dry
sugar cane.

Leng & Mutchler 17-220.

EEWI-202: from sugar-cane and *Inga vera* trees.

all stages in rotten or dry stalks of sugar cane (900-14,
56-23 det. Hopkins), at Caguas (21-10), at Vega Alta (62-
10), at Barceloneta (26-10), at Añasco (42-10), at Guánica
(237-11, 130-12, 526-14), at Patillas (168-12), at Humacao
(48-13), at Mameyes (183-13); from *Inga vera* at Patillas
(16-21 det. A. D. Hopkins); from guava fruits at Cabo Rojo
(I No. 1585 Leonard 33-116); at light at Bayamón (I No.
2987, 3362).

Xyleborus torquatus Eichhoff

Leng & Mutchler.

Xyleborus spp.

Wetmore 16-87, 106, 107, 111: eaten by Cliff Swallow, Yellow
and Parula Warblers, Honey Creeper.

Danforth 26-77 to 112: eaten by Spotted Sandpiper, Jamaican
Cliff Swallow and Barn Swallow.

Wolcott 24-17, 26, 30: eaten by *Anolis pulchellus*, *A. stratulus*
and *A. cristatellus*.

STREPSIPTERA

Stenocranophilus quadratus Pierce, W. Dwight, "Description of
Two New Species of Strepsiptera (Halcotophagidae) Parasitic
on Sugar Cane Insects", Proc. Ent. Soc. Wash., Vol. 16, No.
3, September, 1914, pp. 126-129.

EEWI-227: "more abundant and killing more of these Ful-
gorids than all its other parasites and predators combined."

reared from *Saccharosydne saccharivora* Westw. on sugar
cane (847-12 TYPE and 974-13).

DIPTERA

- Roeder, Victor von,** "Dipteren von der Insel Porto Rico," etc. Stettiner Entomo. Zeitschrift, pp. 337-349. Stettin, 1885.
- Coquillett, D. W.,** "Report on a Collection of Dipterous Insects from Porto Rico." Proc. U. S. Nat. Museum, Vol. 22, pp. 249-270. Washington, D. C., 1900.
- Aldrich, J. M.,** "Catalogue of North American Diptera." Smithsonian Misc. Collections, Part of Vol. 46, No. 1444, pp. 1-680. Washington, D. C., 1905.
- Root, F. M.,**
29-394 to 405 "Notes on Mosquitoes and Other Blood-Sucking Flies from Porto Rico." Amer. Jour. Hygiene, Vol. 2, No. 4, pp. 394-405, fig. 5. Baltimore, July 1929.
- Curran, C. H.,**
26-1 to 14 "New Diptera from the West Indies." Amer. Mus. Novitates No. 220, pp. 14. New York, June 19, 1926.
- Curran, C. H.,**
27-1 to 9 "New Neotropical and Oriental Diptera in the American Museum of Natural History." Amer. Mus. Novitates No. 245, pp. 9, fig. 1. New York, January 27, 1927.
- Curran, C. H.,**
28-1 to 118 "Diptera or Two-Winged Flies." Scientific Survey of Porto Rico and the Virgin Islands, Vol. 11, part 1, Insects of Porto Rico and the Virgin Islands, pp. 118, fig. 38, ref. 19. New York Academy of Sciences, New York, 1928.
- Curran, C. H.,**
31-1 to 23 "First Supplement to the 'Diptera of Porto Rico and the Virgin Islands'." Amer. Mus. Novitates No. 456, pp. 23, fig. 4. New York, February 11, 1931.

The papers of Von Roeder and Coquillett were not available for the preparation of this list, but all their records are given by Aldrich, and when listed here, imply that in addition, they occur in Aldrich's paper. Dr. Aldrich has named practically all the Diptera collected by the workers at the Insular Station, and unless otherwise specified, determination by him is always implied. The writer is also greatly indebted to him for reviewing and suggesting numerous changes and corrections in the first copy of this list. — Prof.

C. L. Metcalf has determined some of the Syrphidae, Mr. W. R. Walton described several of the Tachinidae, Mr. J. R. Malloch has described and determined a considerable number of flies in other families, and Mr. C. T. Greene has made some determinations.

Since the appearance of the first copy of this list, Dr. Chas. P. Alexander has published extensively on the Tipulidae, Dr. W. C. Earle on the Culicidae, and Mr. C. H. Curran on the other families of Diptera. Dr. J. M. Aldrich and Mr. C. T. Greene have made most of the determinations recorded under the Interception Numbers (I No.).

TIPULIDÆ

Alexander, Chas. P., "The Crane-Flies of Puerto Rico". Jour. 33-347 to 387 Dept. Agr., P. R., Vol. 16, No. 4, pp. 347-387, pl. 6. San Juan, February 1933.

Dolichopeza (Megistomastix) portoricensis Alexander, C. P., (as *Megistomastix*) "A Peculiar New Crane-fly from Porto Rico." Psyche, Vol. 19, pp. 63-66, pl. 1. Cambridge, 1912: TYPE from El Yunque, P. R., 2,800 ft. elev., Feb. 20, 1900, (C. W. Richmond).

IP-210: mention.

Alexander (in Curran) 28-9: a male from El Yunque.

Alexander 33-355: "the smallest Tipuline species in the island. It is readily told by the apically hairy wings, with a peculiar veination, and by the greatly elongated antennae of the male sex."

Brachypremna unicolor Osten Sacken, C. R., "Studies on Tipulidae, Part II". Berlin Ent. Zeitschrift, Vol. 31, p. 329. Berlin, 1887: TYPE from P. R.

IP-210: mention.

Alexander 33-354: "conspicuous—long, very narrow wings."

Megistocera longipennis Macquart

Roeder. Gundlach, "no es rara".

Alexander, C. P., Jour. N. Y. Ent. Soc., Vol. 22, No. 3. New York, September 1914. IP-210: mention.

Alexander 33-354: no new collections since Roeder.

Limonia (Limonia) hoffmani Alexander, C. P., "Records and Descriptions of Neotropical Crane-flies (Tipulidae, Diptera) III". Jour. N. Y. Ent. Soc., Vol. 35, No. 3, pp. 265-266. New York, September 1927: TYPE from El Yunque, P. R. (W. A. Hoffman).

Alexander 33-356: also from Las Cruces and mountains between Yauco and Lares.

Hoffman: at Villalba, elev. 1,600 ft.

Limonia (Neolimnobia) diva Schiner

Alexander 33-357: from El Yunque.

Limonia (Dicranomyia) brevivena Osten Sacken **torrida** subsp. nov.

Alexander 33-358: TYPE from Vieques Id. (M. D. Leonard).

Limonia (Dicranomyia) divisa Alexander

Alexander 33-359: from El Yunque (M. D. Leonard).

Hoffman: at Villalba, elev. 1,600 ft.

Limonia (Dicranomyia) distans Osten Sacken

Alexander 33-359: on Vieques Id. and at Río Piedras, P. R.
(M. D. Leonard).

Limonia (Rhipidia) domestica Osten Sacken

Alexander (in Curran) 28-9: at Manatí.

Alexander 33-360: at Santurce, Río Piedras, Coamo Springs
and Vieques Id. (M. D. Leonard), "told by the two sub-
terminal segments of the antennae being pale yellow".

Hoffman: at Villalba, elev. 1,600 ft.

Limonia (Geranomyia) antillarum Alexander

Alexander 33-362: at Coamo Springs.

Hoffman: at Villalba, elev. 1,600 ft.

on grapefruit at Bayamón (1 No. 2480 as *G. rostrata* Say
det. C. T. Greene).

Limonia (Geranomyia) cinereinotata Alexander

Alexander 33-363: from El Yunque and Río Piedras.

(as *G. (G.) domingensis*) Alexander (in Curran) 28-9: at Ma-
meys.

Limonia (G.) myersiana Alexander

Hoffman: at Villalba (El Semille), elev. 1,600 ft., at light
Jan. 26, 1935.

Limonia (Geranomyia) rufescens Loew, H., "Beschreibung einiger
neuen *Tipularia terriicola*". Linn. Ent., Vol. 5, p. 396, pl. 2,
fig. 9-12. 1851: TYPE from P. R.

Roeder. Gundlach, "El ejemplar típico era de Puerto Rico.
Hasta ahora no se ha encontrado en otras islas".

IP-210: mention.

Alexander 33-363: no collection since that of type.

Limonia (Geranomyia) tibialis Loew

Alexander 33-365: on Vieques Id. (M. D. Leonard).

Hoffman: at Villalba, elev. 1,600 ft.

Limonia (G.) virescens Loew

Hoffman: at Villalba (El Semille), elev. 1,600 ft., at light
Jan. 26, 1935.

Helius (Helius) albitarsis Osten Sacken, C. R., (as *Rhamphidia*), "Studies on Tipulidae, Part II". Berlin, 1887: TYPE from P. R.

(as *Rhamphidia*) IP-210: mention.

Alexander 33-66: on El Yunque (W. A. Hoffman).

Polymera (Polymera) geniculata Alexander, C. P., "Insecutor Insctiae Menstruus, Vol. 3, No. , pp. 106-107. Washington, D. C., 1915: TYPE from Carolina, P. R., in crab-holes under rocks.

Alexander 33-307: reared by W. A. Hoffman from rapidly flowing rocky stream at Barranquitas.

Shannonomyia leonardi Alexander, C. P., 33-368, fig. 11: TYPE from El Yunque. P. R., (M. D. Leonard)

Shannonomyia triangularis Alexander, C. P., (as *Pilaria*), "Records and Descriptions of Neotropical Crane-flies (Tipulidae Diptera) III". Jour. N. Y. Ent. Soc., Vol. 35, pp. 270-271. New York, September, 1927: TYPE from El Yunque, P. R., (W. A. Hoffman).

Alexander 33-369: other from El Yunque (M. D. Leonard).

Hexatoma (Eriocera) ocellifera Alexander, 15-104 to 105: TYPE from Mayagüez, P. R., (R. H. Van Zwaluwenburg).
Alexander 33-370: no collection since that of type.

Hexatoma (Eriocera) trifasciata Roeder 85-338 (as *Eriocera*): TYPE from P. R.

Gundlach, "rara". IP-210: mention.

Alexander 33-370: no collection since that of type.

Gonomyia (Lipophleps) bicornuta Alexander 27-276 to 277: TYPE from El Yunque. P. R., (W. A. Hoffman).

Alexander 33-372: another from El Yunque (M. D. Leonard).

Gonomyia (Lipophleps) bifligera Alexander 33-372: TYPE from Las Cruces, P. R., (M. D. Leonard).

Hoffman: at Villalba, elev. 1,600 ft., at light Jan. 26, 1935.

Gonomyia (Lipophleps) helophila Alexander

Alexander (in Curran) 28-9: at Coamo.

Alexander 33-373, fig. 20: on Vieques Id., and at Santurce (M. D. Leonard).

Gonomyia (Lipophleps) pleuralis Williston

(as *Atarba (Gonomyia)*) Coquillett. Alexander 13-504. IP-210:

Alexander 33-374: at Aguadilla (A. Busck), Coamo and Santurce.

Gonomyia (Lipophleps) producta Alexander

Alexander 33-374: on Vieques Id., (M. D. Leonard).

Gonomyia (Lipophleps) subterminalis Alexander 27-275 to 276:
TYPE from El Yunque, P. R., (W. A. Hoffman).

Alexander 33-374: also from Las Cruces, (M. D. Leonard).

Teucholabis (Teucholabis) portoricana Alexander sp. nov. (MS name) Hoffman: at El Semille, Villalba, elev. 1600 ft.. at light, Jan. 26, 1935.

Trentepholia (Paramongoma) niveitarsis Alexander, C. P., (as *Mongoma*), "A Synopsis of Part of the Neo-Tropical Crane-Flies of the Sub-family Limnobiidae". Proc. U. S. Nat. Mus., Vol. 44, No. 1966, p. 501. Washington D. C., April 30, 1913: TYPE from P. R.

Alexander 33-375: all records in P. R. from El Yunque.

IP-209: mention.

Erioptera (Mesocyphona) caloptera Say

Alexander 33-377: from El Yunque (M. D. Leonard).

Erioptera (Mesocyphona) portoricensis Alexander 33-377, fig. 18:

TYPE from El Yunque, others from Las Cruces, P. R., (M. D. Leonard).

Toxorhina (Toxorhina) fragilis Loew 51-401: TYPE from P. R.

Roeder. Gundlach, "El tipo era también de Puerto Rico, donde solamente ha sido observado la especie". IP-210: mention.

Alexander 33-378: redescription.

BLEPHAROCERIDÆ

Paltostoma argyrocineta Curran 27-1: TYPE from Río Grande, P. R.

PSYCHODIDÆ

Psychoda albipuncta Williston—det. J. M. Aldrich

(as *Pericoma*) AMC: at Mayagüez xi-30 det. Curran. ii-30, xi-27, x-30, vii-31, Coamo vii-32, vi-32.

reared by F. Seín in stagnant water with decaying organic matter from eggs laid on the side of the tube, close to the surface of the water (193-22); (I No. 2116, 2432 as *albipunctata* det. Alan Stone), reared from dead cockroach in water at Mayagüez (I No. 4816); at Mayagüez (I No. 4992 as "sp." det. C. T. Greene).

Psychoda alternata Say—det. Alan Stone

on "palo de mato" at Bayamón (I No. 5132).

Psychoda severini Tonnoir

(as *P. phalaenoides* L.) Stahl. IP-210.

CHIRONOMIDÆ

Chironomus redeuns Walker

Coquillett. Curran 28-13: no specimens from P. R.

Chironomus anonyms Williston

Tower 12-6: at Mayagüez, from water in old pail.

Crictopus conformis Curran 28-12: PARATYPES from Manatí, P. R.

Crictopus insolitus Curran 28-11, fig. 1: TYPE from Mayagüez, others from Manatí, P. R.

CERATOPOGONIDÆ

Hoffman, W. A., "A Review of the Species of Culicoides of North and Central America and the West Indies". Amer. Jour. Hygiene, Vol. 5, No. 3, pp. 285-289. Baltimore, 1925.

Culicoides phlebotomus Williston—det. J. M. Aldrich "jejen"

EEP-169: "las plagas o jejen", abundant on beaches, able to penetrate mosquito-bars, rarely troublesome on the second story of houses.

AMC: at Joyuda, many dates.

Hoffman 25-286: the following record.

on the beach at Mameyes, biting man (338-22), at Pt. Can- grejos (GNW—det. O. A. Johannsen),

Culicoides furens Poey

Root 22-396: the common "sand-fly of the coastal region".

Hoffman 25-288: recorded from Río Piedras & Aguirre, P. R.

AMC: at Joyuda, many dates.

(I No. 3541 det. Alan Stone); "This species common every- where near the sea; reared from larvae at and above tide level in the Condado Lagoon 1928, and in small pools at Es- cambrón, 1933. A vicious biter". W. A. Hoffman.

Ceratopogon punctipennis Williston

Coquillett.

Ceratopogon sequax Williston

Coquillett.

Forcipomyia eriophora Williston—det. J. M. Aldrich

(as *Ceratopogon*) Curran 28-11: from Mayagüez.

EEWI-63: giving the following data.

sucking juices from the larva of *Phlegethontius sexta* Joh. 183-22), probably this species (84-16 "flies taken with mouth- parts firmly fixed in larvae, feeding voraciously, their bodies distended with the body juices of the host. Actions watched for some time; flies quite sluggish and not easily disturbed" R. T. Cotton, 844-16 "its color seemed green it was so inflated with the juice". E. G. Smyth).

Forcipomyia pergandei Coquillett—det. O. A. Johannsen
larvae, deeply constricted between segments, with two white balls on most segments sticking up above the general level of the insect, abundant on rotten flame at Isabela (171-31), on rotten banana corm at Río Piedras (F. Seín), pupae formed with the anterior end sticking out of the larval skin.

Forcipomyia propinqua Williston—det. Alan Stone
at Mayagüez (I No. 4993).

Stilobezzia coquilletti Keiffer—det. Alan Stone
resting on grapefruit at Arecibo (I No. 2145, 2146).

Stilobezzia picta Coquillett—det. Alan Stone
in grapefruit grove at Añasco (I No. 4275).

CULICIDÆ

- Tower, W. V.,** 21-1 to 10. "A Study of Mosquitoes in San Juan, Porto Rico". Circ. No. 14, P. R. Agr. Expt. station, pp. 23 (June 1911). Mayagüez, P. R., 1912.
- Tower, W. V.,** 12-1 to 23. "Mosquito Survey of Mayagüez". Circ. No. 20, P. R. Agr. Exp. Station, pp. 10. Washington, D. C., November 2, 1921.
- Howard, L. O.,
Dyar, H. G. &
Knab, Fred.,** "Mosquitoes of North and Central America and the West Indies". Carnegie Institute of Washington Publication No. 159: Vol. 1, pp. 520. Washington, D. C., 1912. Vol. 2, pl. 150. Washington, D. C., 1912. Vol. 3, pp. 523. Washington, D. C., 1915. Vol. 4, pp. 524-1064. Washington, D. C., 1917.
- King, W. W.,** "The Epidemic of Dengue in Porto Rico, 1915". New Orleans Med. Surg. Jour., Vol. 49, No. 8, pp. 564-71. New Orleans, February 1917.
- Earle, W. C.,** 25-12 to 18. "Malaria Surveys in Porto Rico." P. R. Health Review, Vol. 1, No. 4, pp. 12-18. San Juan, October 1925.
- Dyar, H. G.,** "The Mosquitoes of the Americas". Carnegie Institution of Washington Pub. No 387. Washington, D. C., 1928.
- Kumm, H. W.,** "The Geographical Distribution of the Malaria-Carrying Mosquitoes". Amer. Jour. Hygiene Monographic Series No. 10. Baltimore, 1929.
- Wells, C. W.,** "The Identification of the Anophelene Mosquitoes of Porto Rico". Amer. Jour. Tropical Medicine, Vol. 10, pp. 243-248. Baltimore, 1930.

- Earle, W. C.**, "Malaria in Porto Rico". Amer. Jour. Tropical Medicine, Vol. 10, No. 3, pp. 207-230, ref. 8. Baltimore, 1930.
- Edwards, F. W.**, "Diptera. Fam. Culicidae". Genera Insectorum, Fasc. No. 194. pp. 258, pl. 5, many ref. Brussels, 1932.
- Dixa sp.**, prob. *clavulus* Williston
Hoffman: larvae in streams near Pueblo Viejo and Barranquitas.
- Corethrella spp.**, ? prob. *appendiculata* Grabham
Hoffman: larvae collected, but not reared, from tree hole near Guayama.
- Wyeomyia mitchellii** Theobald ?—det. W. A. Hoffman
(as sp.) Twinn (in Curran) 28-10: at Adjuntas.
reared from larvae in bromelid on El Yunque, Nov. 4. 1934.
- (Corethra punctipennis** Say
Roeder. Gundlach.
"does not occur in P. R." W. A. Hoffman.)
- Anopheles albimanus** Wiedemann
Roeder. Gundlach. Howard. Dyar & Knab 17-984.
Tower 21-6: "the malarial mosquito—in rain-water barrels."
Root 22-396: "Probably common throughout the coastal plain.
Larvae were found in many different kinds of pools, swamps, irrigation ditches, etc., often unshaded, but usually with some aquatic vegetation. More abundant near the coast and lagoons than a few miles inland. Adults attack man readily in the evening."
Earle 25-12: the most important vector of malaria.
Kumm 29- : at Aguirre, Salinas, Guayama, San Germán, Caguas, Río Piedras, Sunoco, Cataño, Fajardo (W. A. Hoffman).
Earle 30-214: "throughout most of the island."
Earle, W. C., "Notes on the Life-History of *Anopheles albimanus* and *grabhamii*." P. R. Jour. Public Health & Tropical Medicine, Vol. 7. No. , pp. 381-384. San Juan, 1932.
in Harvey area of Luquillo National Forest at 850 ft. elev. October 1934 (W. A. Hoffman).
- Anopheles grabhamii** Theobald
Howard, Dyar & Knab 17-1009: first record from P. R.
Tower 21-6: "legs—very long. The last ankle segment is white and there is a black band next to the claw."
Root 22-395: "Probably found throughout the coastal plain, but in smaller numbers than *A. albimanus*. Breeding places much more local and difficult to find than those of *albimanus*. The places where I found larvae were all well shaded, with considerable aquatic vegetation. Larvae collected at Martín Peña and Aguirre. (Adult) attacks man readily in the evening."
at Dorado and on Vieques Id. (W. A. Hoffman).

Anopheles vestitipennis Dyar & Knab

Dyar, H. G., "The Male of *Anopheles vestitipennis* Dyar & Knab (Diptera, Culicidae)." Insecutor Insectiae Menstruus, Vol. 12, No. 10, p. 171. Washington, D. C., 1924: description of the male, first found in P. R.

Johnson, H. A., "Occurrence of *Anopheles vestitipennis* in Porto Rico". Amer. Jour. Tropical Medicine, Vol. 6, No. 2, pp. 153-155. Baltimore, March 1926: in ditch in cane field at Barceloneta.

Earle 25-12: quite abundant at certain seasons.

Earle 30-214: only on the coast, October to January.

collected by Dr. Earle at Sunoco, Loíza, Humacao and Salinas (W. A. Hoffman).

Megarhinus portoricensis Roeder 85-337: TYPE from P. R.

Gundlach. Root 22-395: "larvae in tree-holes."

larvae in tin can at Guaynabo in 1927 (W. A. Tower), in tree-hole near Guayama, collected, reared and determined W. A. Hoffman.

Uranotaenia loewii Theobald

Root 22-397: "larvae were found in grassy meadow pools kept filled for some time by the frequent rains----at Río Piedras. Adult collected in house, Río Piedras, August 26, (1921)."

Uranotaenia sapphirina Osten Sacken

(as *U. socialis* Theobald) Root 22-397: "Larvae---- always present in a small swampy ditch containing *Spirogyra* in a young cane-field near Río Piedras June 25, July 6, Aug. 12, Sept. 5, (1921)."

Psorophora jamaicensis Theobald

Howard, Dyar & Knab 17- : at Bayamón, January 1899 (A. Busck).

Root 22-399: "Larvae----in temporary rain pools at Río Piedras, Aug. 26, 31, and in a recently flooded irrigation ditch at Aguirre, August 18 (1921)."

Mansonia perturbans Walker

(as *Taeniorhynchus*) Howard, L. O., Bull. No. 25, n. s. Bur. Ent., U. S. Dept. Agr. Washington, D. C., 1910.

Mansonia titillans Walker—det. Alan Stone

at Mayagüez (I No. 4550).

Aedes sollicitans Walker—det. W. A. Hoffman, confirmed F. M.

Root

at San Juan, October 1930.

Aedes taeniorhynchus Wiedemann

(as *Culex portoricensis*) Ludlow, C. S., Canadian Ent., Vol. 39, p. 386. London, Ontario, 1905: TYPE from P. R.

(as *Aedes (Taeniorhynchus) portoricensis* Ludlow) Root 22-397: "larvae----in temporary rain pools near a large lagoon, adults biting man by day in mangrove swamp. at Río Piedras, Aguirre."

Hoffman: at Dorado, Nov. 1930, July & Aug. 1935, at San Juan, Oct. & Nov., 1932. July & Aug., 1935.

***Aedes* ? *condolecens* Dyar & Knab**

Root 22-398: larvae in temporary rain pools near Río Piedras, August 26, 1921, all died before pupating; description of larvae. •

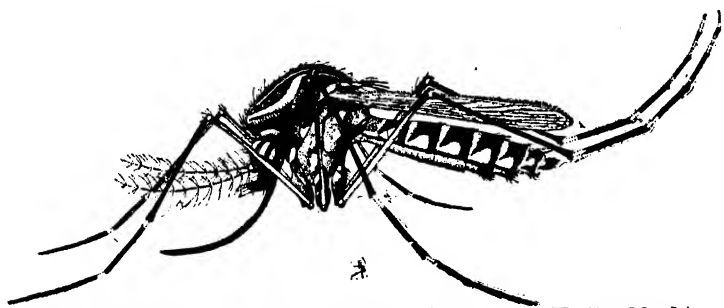
***Aedes mediovittatus* Coquillett**

Tower 08-38: mention.

Tower 12-6: at Mayagüez, in hollow tree trunks, tin cans and bamboo pots.

Twin (in Curran) 28-10: at Naguabo.

Hoffman: in tree hole at Palmas Abajo, near Guayama, Oct. 1930, Feb. 1931; at Toa Alta, Dec. 1931; at Sabana Llana, Sept. 1933; at Pueblo Viejo, Aug. 1935; reared from bamboo at Barrio Rubio, Yauco, April 1932.



Aedes aegypti L. Greatly enlarged. (Drawn by H. Bradford.)

***Aedes (Stegomyia) aegypti* L.**

(as *Culex fasciatus* F.) Gundlach.

(as *A. (S.) calopus* Meigen) Van Z. (1728).

(as *S. calopus*) Tower 08-38: mention.

Tower 12-6: mention.

Dyar, H. G., Insecutor Inscitiae Menstruus, Vol. 8. No. 10-12, p. 181. Washington, D. C., 1920.

Tower 21-5: "The Yellow-Fever Mosquito." Notes.

Root 22-397: "Very common in and around houses everywhere in swarming in artificial containers about houses. Adults or larvae collected at Río Piedras (July 2, 10, 12, August 3, 6, 10), Aguirre (June 30, August 18, 19), Quebradillas (June 29), Ponce (June 29, 30)." 1921.

Twinn (in Curran) 28-10: from Mona Id.

McKinley, E. B., "The Salivary Gland Poison of *Aedes aegypti*".
 Preo. Soc. Expt. Biol. & Medicine, Vol. 26, No. 9, pp. 806-809.
 New York, June 1929.

Kudo, R., "Studies on Microsporidia parasitic in Mosquitoes.
 viii. On a Microsporidian, *Nosema aedis* nov. spec., parasitic
 in a larva of *Aedes argenteus (aegypti)* of Puerto Rico."
 Archiv. Protistenk, Vol. 49, No. 1, pp. 23-28, pl. 2, ref. 47.
 Jena, January 15, 1930.

AMC: at Mayagüez, Coamo.
 (I No. 3353).

Culex bahamensis Dyar & Knab—det. F. M. Root

Hoffman: in turbid outlet of small lake near the coast at Dorado
 (la Sardinera), Aug. 15, 1930.

Culex habitator Dyar & Knab—det. F. M. Root

Hoffman: in stagnant ditch at Dorado (la Sardinera) Oct. 1,
 1930.

Culex secutor Theobald

(as *Culex toweri*) Dyar, H. G., & Knab, Fred, "Descriptions of
 Some American Mosquitoes". Jour. N. Y. Ent. Soc., Vol. 15,
 No. 1, p. 13. New York, March 1907: TYPE from P. R.

(as *Culex toweri*) Tower 08-38: mention. Tower 12-6: in
 bamboo pots at Mayagüez.

(as *Culex salinarius* Coquillett) Tower 08-38: mention.

Hoffman: at Jácome Alto, June 18, 1930, det. F. M. Root.

Culex nigripalpus Theobald

(as *Culex similis* Theobald) Tower 12-6: mention.

Root 22-399: "Larvae in small numbers in temporary meadow
 pools at Río Piedras, July 13, and in enormous numbers in a
 ditch highly polluted with sewage at Fajardo, August 29
 (1921)."

Hoffman: in small pond at Dorado (la Sardinera) Sept. & Oct.,
 1930 det. F. M. Root.

(I No. 2719), at light at Mayagüez (I No. 2368 Leonard
 33-135).

Culex fatigans Wiedemann

(as *Culex pipiens* L.) Stahl. Tower 08-38: mention.

(as *Culex cubensis* Bigot) Tower 08-38: mention.

(as *Culex quinquefasciatus*) Howard, Dyar & Knab 17-237: at
 Mayagüez (W. V. Tower); on Vieques Id., July 31, 1910
 (C. C. Craft); at Guayama, April 9 & 10, 1901 (R. A. Pear-
 son).

(as *Culex quinquefasciatus* Say) Tower 12-6: "the common
 house mosquito of the tropics." Van Z. (1729). Tower 21-5:
 a short description and notes on habits.

Root 22-399: synonymy. "Common everywhere in the coastal
 plain, breeding in all sorts of artificial containers and biting
 man readily in the evening. Adults or larvae collected at Río

Piedras, June 26, July 9, August 3. 9, 10, 30, Aguirre June 30, August 18, 20, Quebradillas June 29, Ponce. June 29, 30, (1920)."

Hoffman, W. A., Marin, R. A., & Burke, A. M. B., "Filariasis in Porto Rico". P. R. Rev. Public Health & Tropical Medicine, Vol. 4, No. 3, pp. 120-127, map. San Juan, 1928: found in all localities examined but scarcer at higher altitudes. (as *C. quinquefasciatus* Say) Twinn (in Curran) 28-10: many specimens.

AMC: many records.
at Guayama (I No. 3968).

Hoffman: "apparently well distributed throughout the Island, being encountered at such high altitudes as Maricao and above Aibonito in great numbers. It prefers polluted water and breeds in latrines and septic tanks."

Culex atratus Theobald

Root 22-400: "a single male from a pupa collected in a semi-permanent roadside swamp at Martín Peña, July 14, (1921)."

Hoffman: on Monteflores Hill, San Juan, April 26, 1929; in cattail swamp at Dorado (la Sardinera) Jan. 29, 1931; in small lake at Dorado (la Sardinera) Feb. 19, 1931—all det. F. M. Root.

Culex inhibitor Dyar & Knab—det. F. M. Root.

(as *Culex (Choeroporpa) borinqueni*) Root 22-400 to 405, fig. 3: TYPE from P. R., "the commonest 'wild' *Culex* of the Porto Rican coastal plain, found breeding in all sorts of ditches, slow streams, pools, and marshy places,----at Río Piedras, Martín Peña, Aguirre".

Hoffman: at Dorado (la Sardinera) Feb. 1932.

Culex antillum-magnorum Dyar—det. F. M. Root

(as *Culex bisulcatus* Coquillett) Tower 08-38 & 12-6 : at Mayagüez, from water in old pail.

Hoffman: at Palmas Abajo (near Guayama) and at Jájome Alto, February 1931; in bromeliads, elsewhere and on El Yunque, June 1935.

Deinocerites cancer Theobald

Root 22-405: "Probably found throughout the coastal plain near the ocean and the lagoons, where crab-holes occur. Adults or larvae were collected at Río Piedras, July 7, 18, Martín Peña, August 16, 25, Aguirre, August 20 (1921)."

larvae in crab-holes at Dorado (W. A. Hoffman).

MYCETOPHILIDÆ

Mycetophila merdigera Knab, F. & Van Zwaluwenburg. R. H., "A Second Mycetophila with Dung-bearing Larva (Diptera; Mycetophilidae)". Ent. News, Vol. 29, No. 4, pp. 138-142, pl. 1. Philadelphia, April 1918: TYPE from Aibonito, P. R., one

male reared from larva on *Inga laurina* (R. H. Van Zwabenburg), another male from larva on pomarrosa at Mayagüez (Van Z.).

larvae on guamá at Aibonito (627-17 R. T. Cotton).

Mycetophila insipiens Williston—det. Alan Stone
resting on *Inga vera* at Jayuya (I No. 3733).

Leia mutchleri Curran 28-14, fig. of wing: TYPE from Adjuntas, P. R.
(as "sp.") at Añasco (I No. 4278).

Boletina incompleta Curran 28-13, fig. of wing: TYPE from Adjuntas, P. R.

Sciara hartii Johannsen—det. O. A. Johannsen
from earth in can in which larvae of *Diaprepes abbreviatus* L. were being reared, at Isabela, Feb. 25, 1932 (GNW).

Sciara spp.

larvae in cottony substance secreted by mealybugs on sugarcane (16-12 det. F. Knab); adults on corn leaves at Aguadilla (29-22, 228-22 det. C. T. Greene); reared from chayote at Mayagüez (I No. 5275 det. C. T. Greene); a plague at light, lower story of house at Isabela, October and November (172-31 det. O. A. Johannsen).

CECIDOMYIDÆ (ITONIDÆ)

Asynapta citrinae Felt, E. P., "A New Citrus Cambium Miner from Puerto Rico". Jour. Dept. Agr., P. R., Vol. 16, No. 2, pp. 117-118. San Juan, July, 1922.
from grapefruit at Isabela (152-31 TYPE GNW).

Arthrocnodax constricta Felt, E. P., Jour. Ec. Ent., Vol. 9, No. 6, p. 481, December 1914: "from garden beans infested with the common red spider, *Tetranychus bimaculatus*, and probably predaceous thereupon." (479-13 TYPE.)

Arthrocnodax macrofila Felt—det. E. P. Felt
on mite-infested cattle feed (55-25).

Karschomyia cocci Felt, E. P., Can Ent. Vol. 45, No. 9, pp. 304-305, 1913: from *Pseudococcus sacchari* Ckll. on sugar cane at Patillas (242-13 TYPE).

Jones 14-461: mention.

Smyth 20-124: probably this species from *Pseudococcus virgatus* Ckll. on cotton. "The adults display the strange habit of hanging in rows festooned on strands of spider-web, where they perform a rocking motion by means of the wings."

EEWI-234: quoting Smyth.

reared from *Pseudococcus sacchari* Ckll. (556-16).

Mycodiplosis insularis Felt 14-305: from red spiders, *Caligonus antillarum* sp. nov. Banks, on leaves of *Leontis nepetaefolia* (582-12 TYPE).

reared from same host on leaves of *Asclepias curassavica* (695-12).

Kalodiplosis multifila Felt—det. E. P. Felt

reared from *Pseudococcus citri* on mulberry (56-25).

possibly **Dasyneura eugeniae** Felt—det. C. T. Greene

from witches broom on crape myrtle (21-34).

Cecidomyia coccidarum Cockerell

Coquillett: "from larvae associated with *Dactylopius (Pseudococcus) citri*—from *Lecanium (Saissetia) hemisphaerica*."

Cecidomyia coccolobae Cook—det. J. A. Stevenson

from small cone-shaped galls on leaves of *Coccolobis piri-folia* (728-17) and *Coccolobis uvifera* (729-17).

Ctenodactylomyia watsoni Felt

from galls on sea-grape, *Coccolobis uvifera*, in letter of Feb. 9, 1917, by R. H. Van Zwaluwenburg.

BIBIONIDÆ

Scatopse pygmaea Loew

Coquillett.

(as sp.) Wetmore 16-71, eaten by hummingbird, *Chlorostilbon mangoci*.

Dilophus sp.

Wetmore 16-73, eaten by hummingbird, *Anthracothorax viridis*.

SIMULIIDÆ

Bradt, Schuyler,

"Notes on Porto Rican Blackflies". P. R. Jour. Public Health & Tropical Medicine, Vol. 8, No. 1, pp. 69-81, fig. 5. San Juan, 1932.

Simulium haematopotum Malloch—det. J. R. Malloch

Dyar, H. G. & Shannon, R. C., "The North American Two-winged Flies of the Family Simuliidae". Proc. U. S. Nat. Mus., Vol. 69, Art. 10, pp. 1-54. Washington, D. C., 1927: on p. 38, at Río Piedras, Jan. 24, 1912 (T. H. Jones).

Bradt 32- : notes.

low hills (69-12, 503-17).

Simulium minisculum Lutz—det. J. M. Aldrich

Bradt 32- : notes.

abundant in the spring (212-22).

Simulium quadrivittatum Loew

Wetmore 16-66: eaten by P. R. Tody, *Todus mexicanus*.

Malloch, J. R., "American Black Flies, or Buffalo Gnats". U. S. Dept. Agr., Bur. of Ent. Tech. Ser. No. 26. Washington, D. C., Apr. 6, 1914: on p. 61-62, "Biting flies" at Utuado (C. W. Richmond).

(as spp.) EEP-170: "los majes".

Root 22-396: notes on personal reactions to bite.

AMC: at Cidra ii-32 det. Curran.

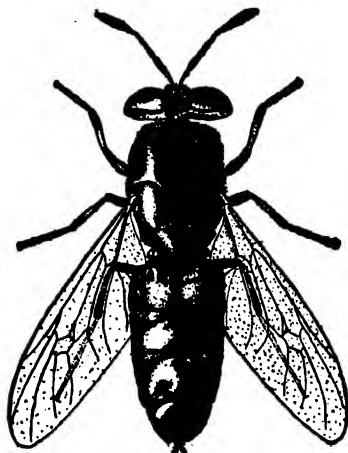
Bradt 32-69: original observations on habits and development.

(I No. 4858), in clearing in woods (214-13 det. Malloch), near coffee grove (GNW det. O. A. Johannsen); attacking man at Cidra (I No. 3582); resting on banana leaf at Corozal (I No. 4117), on flamboyant leaf at Bayamón (I No. 5122).

STRATIOMYIDÆ

Hermetia albitarsis F.

(as *H. sexmaculata*) Macquart, J., Hist. Nat. Dipt., Vol. 1, p. 229. Paris, 1834.



Hermetia illucens L. Three times natural size. (Drawn by F. Maximilien.)

Hermetia illucens Linn.

Stahl. Roeder. Gundlach, "se posa muchas veces sobre los troncos de los árboles recién cortados". Coquillett.

Van Z. (P. R. 108). Curran 28-18: at Ponce.

AMC: at Luquillo vi-32, vii-32, Yabucoa viii-30, Ponce i-31, Coamo vi-32, vii-32, Yauco xii-32, Cabo Rojo xii-30, Lajas xii-32, and many records at Mayagüez.

(I No. 4146B, 258-12, 267-12, 471-12, 316-12, 767-12, 77-13, 747-14, 377-16, 562-17); at Guánica (639-13, 427-

14); at Arecibo (I No. 3709, 3710); on fruit of *Annona muricata* at Ponce (I No. 2671); on grapefruit leaf at Naguabo (I No. 3934). larvae breeding in "cachaza" filter-press cake (594-17).

Sargus bicolor Wiedemann, C. R. W., *Aussereuropäische Zweiflügelige Insekten*, Vol. 2, p. 41, 1830.

Geosargus lucens Loew—det. C. T. Green
on achiote at Arecibo (I No. 4944).

Macrosargus lateralis Macquart—det. C. T. Greene
in grapefruit grove (554-17); (as "sp." 622-12, 850-16, 553-17); at Aibonito (SSC).

Neorondania chalybea Wiedeman—det. F. Knab

Van Z. (P. R. 1244) from *Spondias lutea*.

Wolcott 24-31: eaten by *Anolis cristatellus*.

larvae beneath stinking, flaking bark of dying papaya, *Carica papaya*, tree (843-12); from banana stem (770-16); adults at Ponce (I No. 5580); resting on orange at Trujillo Alto (I No. 696), at Cidra (I No. 1353 Leonard 32-144); on grapefruit at Arecibo (I No. 2140 Leonard 33-137); on *Spondias lutea* at Bayamón (I No. 2685).

Odontomyia dorsalis Fabr.

Coquillett.

Curran 28-17: at San Juan.

AMC: at Cartagena Lagoon iii-27 det. Curran, La Tortuguera iii-27. La Plata iii-29, Mayagüez iii-29.

Odontomyia near **trivittata**—det. C. T. Greene
at Arecibo (I No. 1016).

Odontomyia virgo Wiedemann—det. C. T. Greene
on grapefruit leaf at Barceloneta (I No. 4017).

Neurota bicolor Wiedemann

(as *Sargus*) Curran 31-2: from Vieques Id., redescription.

Nemotelus monensis Curran 28-16: TYPE from Mona Id.

Nothomyia calopus Loew

Curran 28-15: from Adjuntas.

AMC: at Mayagüez viii-30 det. Curran, Río Piedras vi-32, v-32.

Pedicella schwarzi Curran 28-15: TYPE from Cayey, P. R.

Cyphomyia lasiophthalmus Williston

Curran 28-18: from Cayey.

AMC: at Mayagüez x-30 det. Curran, and many others, Desecheo Id. v-27, San Germán xii-32, Ponce xii-31, iii-31, Coloso vii-32, Aguada xii-32, Río Piedras i-32, xii-31.

Microchrysa flaviventris Wiedemann—det. C. T. Greene
at Yauco (I No. 5579).

Microchrysa polita L.—det. C. T. Greene
in grapefruit grove at Garrochales (I No. 543).

Spyridopa sp.—det. C. T. Greene
on mango blossoms at Mayagüez (I No. 3826).

Euryneurasoma slossonae Johnson—det. C. T. Greene
at light (I No. 4388, 5223).

TABANIDÆ

Chrysops variegatus DeGeer

(as *Chrysops costatus* Fabr.) Stahl. Roeder. Gundlach "muy común en terrenos bajos, donde suele posarse encima de las orejas de los caballos para chupar la sangre por lo cual es insecto muy molesto." Van Z. (P. R. 100). Root 22-405: "mosca de mangle." 1-214: at Pueblo Viejo (161-15, 175-15, 184-15), Añasco (1028-13).

(as *C. costatus*) Danforth 20-112 to 121: eaten by Barn Swallow and Prairie Warbler.

Curran 31-3: synonymy; from Coamo and Mayagüez.

(as *C. costatus*) Van Volkenburg 32-25, 33-23 & 35-24: mention, attacking domestic animals.

AMC: at Joyuda v-30, Añasco iv-30, Yabucoa vii-30, Aguada xii-31, Aguadilla xii-32, and many dates at Mayagüez.

at light at Bayamón (I No. 3058); resting on sour lime at Mayagüez (I No. 502); on grapefruit (I No. 503, 504, 627).

Tabanus hookeri Knab, F., "Some West Indian Diptera". Insector Insectiae Menstruus Vol. 3, No. 4, pp. 48-49. Washington, D. C., 1915: TYPE from Mayagüez, P. R., (R. H. Van Zwaluwenburg).

Curran 31-6: "a small greyish-yellow species", from Vieques Id.

AMC: at Cartagena Lagoon ii-30, v-31 det. Curran, iii-31; at Mayagüez iii-31 det. Curran, x-32; Coloso vii-32, Lajas xii-32, Coamo vii-32, Río Piedras v-32, Luquillo vii-32.

Tabanus nervosus Curran 31-4, fig. of wing: TYPE from Cataño, P. R.

Tabanus nervous Curran 31-4, fig. of wing: TYPE from Cataño, P. R.

AMC: at Santurce xii-31 det. Curran.

Tabanus parvulus Williston

Curran 31-6: from Jájome Alto.

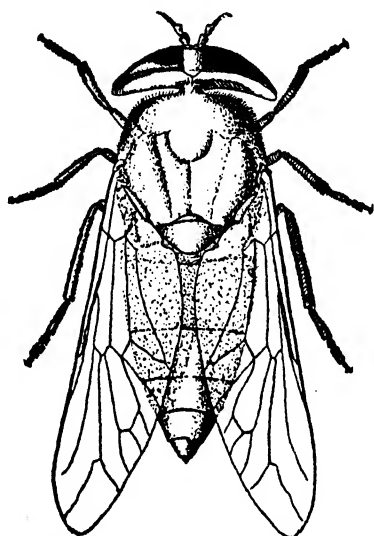
Tabanus sp. near *trilineatus* Latr.—det. Alan Stone
at San Juan (I No. 4150).

Tabanus stigma F.

(as *Tabanus psamophilus* O. S. det. C. T. Greene) IP-214: on the beach, resting on dry seaweed, as which it is the same color, and in which its larvae live, feeding on sand fleas, at Pt. Cangrejos (114-15), at Vega Baja (493-16).

Curran 31-4: synonymy; from Cataño and Guayama.

AMC: at Joyuda v-31 det Curran.



Tabanus stigma F. Five times natural size. (Drawn by F. Maximilien.)

Stenotabanus punctipennis Brunetti—det. Alan Stone
at Yauco (I No. 5570).

RHAGIONIDÆ (LEPTIDÆ)

Curran, C. H., "New Species of *Chrysophilus* from the Neotropical Region (Rhagionidae, Diptera)." Amer. Mus. Novitates No. 462, pp. 7. New York, March 17, 1931.

Chrysophilus cubensis Curran—det. M. D. Leonard
at Aibonito (SSC).

Chrysophilus leonardi Curran 31-4: TYPE from Vieques Id.

Chrysophilus macularis Curran 31-7: TYPE from El Yunque, P. R.

Chrysopila sp.—det. C. T. Greene
on the beach at Pt. Cangrejos (GNW).

BOMBYLIIDÆ

Hyperalonia cerberus F.

(as *Exoprosopa*) Stahl. Roeder.

Gundlach, "muy común en terrenos desmontados" (brushy land).

Curran 28-19: on Mona Id.

Curran 31-7: at Dorado and on Vieques Id.

AMC: at Mayagüez xii-26. Boquerón iv-29.

(I No. 2720); on the beach at Santurce (602-17), at Pt. Cangrejos (GNW), at Dorado (I No. 3604), in tomato field at Loíza Aldea (I No. 3861); on brushy hill north of Ponce (113-13).



A Bombyliid fly from Haiti. Three times natural size.
(Drawn by F. Maximilien.)

Hyperalonia servillei Macquart

Coquillett.

Spongostylum sp.—det. C. T. Greene

in grapefruit grove at Arecibo (I No. 4325).

Phthiria flaviventris Curran 28-21: TYPE from Coamo Springs P. R.

Geron senilis F.

Curran 28-22: from Ensenada and Caguas.

Diplocampta roederi Curran 31-8, fig. 1: TYPE from Vieques Id., others from Ensenada, P. R.

Heterostylum ferrugineus F.—det. F. Knab

AMC: at Mayagüez, 1921, at Río Piedras i-32 (as "sp.") det Curran.

(592-12, 627-12), at Ponce (I No. 5561).

Exoprosopa cubana Loew

Roeder. Gundlach, "rara".

Curran 28-19: from Tallaboa.

Anthrax adusta Loew—det. C. T. Greene

AMC: unlabeled specimen.

at Guánica (424-13).

Anthrax bigradata Loew

Roeder. Gundlach.

Anthrax faunus F.

Roeder. Gundlach.

AMC: at Coamo Springs xi-30 det. Curran, vii-32, ix-32, v-32, viii-32, vi-32, Mayagüez vi-32, at Ponce xii-31 as *Villa* det. Curran.

Anthrax gideon F.

Curran 28-19: at Ensenada and Mameyes.

Anthrax gorgon F.

Stahl. Gundlach. Coquillett.

Box 25-334: hyperparasite on *Elis haemorrhoidalis* F.

(as *Villa*) Curran 28-21: many records, on Mona Id. Curran 31-8: at Guayanilla, on Vieques Id.

AMC: at Algarrobo ii-31 det. Curran, x-30, Coamo viii-32, v-32, xi-30, Río Piedras vi-32.

reared from cocoons of *Elis haemorrhoidalis* F. at Plantaje, Pt. Salinas (64-22, 64A-22 det. C. T. Greene); in tomato field at Loiza Aldea (I No. 3860); in grapefruit grove at Dorado (I No. 4188).

Anthrax irroratus F.

AMC: at Utuado viii-30 det. Curran, Mayagüez iii-29.

Villa lateralis Say

Curran 28-20: many records, on Mona Id.

Curran 31-7: on Vieques Id.

at Mayagüez (I No. 3921 as *Anthrax*).

Anthrax lucifer F.

Stahl. Roeder. Gundlach, "común—suele posarse en el suelo". Van Z. (P. R. 78).

Box 25-342: hyperparasite on *Dielis (Campsomeris) dorsata* F. (as *Villa*) Curran 28-21 & 31-7: many records, at Coamo.

AMC: at Cartagena Lagoon x-32, Yauco xii-32, Añasco x-30, Ponce vi-32 and many dates at Coamo.

at Guánica (423-13 det. C. T. Greene).

Anthrax oedipus F.

Gundlach.

Anthrax paradoxa Jaennicke

Osten Sacken, *Biologia Centrali-Americana*, Dipt., Vol. 1, p. 120. 1886.

Roeder. Gundlach.

(as *Villa*) Curran 28-20: from Ensenada.

THEREVIDÆ

Psilocephala argentata Bellardi

Roeder. (as *Thereva*) Gundlach, "rara".

Psilocephala monensis Curran 26-2: TYPE from Mona Id.

Psilocephala morata Coquillett—det. C. T. Greene
in tomato field at Loíza Aldea (I No. 3779).

Psilocephala vexans Curran 26-2: (TYPE from St. Thomas), others
from El Yunque, Ensenada, Arecibo and San Juan, P. R.,
many from Mona Id.

AMC: at Faro de Cabo Rojo xi-30 det. Curran, iv-30, Mayagüez xii-32, iv-32.

ASILIDÆ

Leptogaster cubensis Bigot

Roeder. Gundlach.

Curran 28-24: from Mona Id.

Atomosia incisularis Macquart

Van Z. (P. R. 1206).

(I No. 2708); in grapefruit grove at Añasco (I No. 4154),
at Mayagüez (I No. 4163): unlabeled specimens, probably
from Guánica.

Atomosia sp. nov.—det. C. H. Curran

AMC: at Coamo Springs xi-30, four from Coamo, three from
Mayagüez.

Ommatius marginellus Fabricius, Spec. Ins., II, 464; Ent. Syst.,
384 (*Asilus*); Syst. Antl., 170 (*Dasypogon*).

Gundlach. Van Z. (P. R. 107).

AMC: at Boquerón iii-29 det. Curran, Ponce xi-29, Coamo vii-
32, vi-32, at Luquillo viii-31 det. Curran.
in grapefruit grove at Dorado (I No. 4936).

Saropogon dispar Coquillett—det. C. T. Greene

resting on sansevieria leaf at Santurce (I No. 4146).

Proctacanthus lutescens Loew

Stahl.

Proctacanthus rufiventris Macquart

Roeder. Coquillett. Gundlach.

Wolcott 22d-16: "quite common."

Curran 28-23: at La Tortiguera.

Wolcott 24-11: eaten by *Ameiva exsul*.

AMC: at Añasco ix-30 det. Curran, Algarrobo iv-30, Río Piedras i-32, v-32.

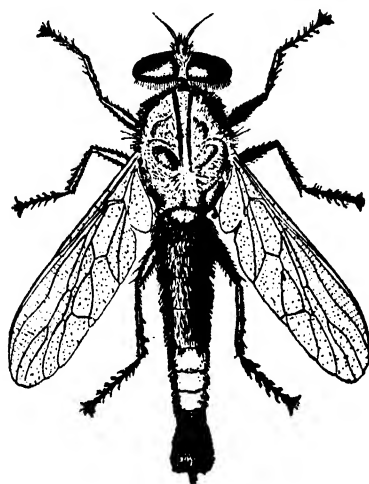
common (561-17, 79-10, 17-14), carrying a large grasshopper at Isabela (GNW) and at Pt. Cangrejos (GNW). at Manatí (I No. 4416); resting on almond leaf at Arecibo (I No. 1480 Leonard 33-137), on lima bean leaf at Barceloneta (I No. 3164).

Townsendia argyrata Curran 26-1: TYPE from El Yunque, P. R.

Curran 28-23: at Coamo.

Townsendia minuta Williston—det. C. T. Greene

at Ensenada (I No. 2972).



Erax bastardi Macq. Three times
natural size. (Drawn by
F. Maximilien.)

Erax bastardi Macquart

Roeder. (as *E. femoratus* Macq.) Gundlach.

Erax danforthi Curran (MS name ?)

AMC: at Utuado viii-30 det. Curran, vii-30, Mayagüez vii-32, Villalba vi-30, Yabucoa vii-30, Coamo vii-32.

Erax forbesi Curran 31-10: TYPE from Coamo Springs, P. R.

Erax portoricensis Hine, Ann. Ent. Soc. America, Vol. 12, No. ,
p. 128. Columbus, Ohio, 1919: TYPE from Ensenada, P. R.
Curran 31-9: mention.

Erax stylatus F.

(as *E. rufitibia* Macq.) Roeder. Gundlach. Van Z. (det. F. Knab).

Curran 31-9: synonymy.

Erax tortola Curran

AMC: at Mayagüez v-30 det. Curran, Coamo vii-32, vii-32, v-32.

DOLICHOPODIDÆ

Van Duzee, M. C.,

"New Dolichopodidae from the West Indies".

Amer. Mus. Novitates No. 262, pp. 10.

New York, March 29, 1927.

Chrysotus barbatus Loew

(as *Syntormon*) Coquillett

Chrysotus brevitibia Van Duzee 27-1: TYPE from Naguabo, P. R.

Van Duzee (in Curran) 28-28: mention.

Chrysotus excavatus Van Duzee

Van Duzee (in Curran) 28-28: at Aibonito.

resting on grapefruit at Arecibo (I No. 1967 Leonard 33-137).

Chrysotus flavus Aldrich

Van Duzee (in Curran) 28-28: at Adjuntas.

Chrysotus flavohirtus Van Duzee

Van Duzee (in Curran) 28-28: at Manatí, Barros, Coamo Springs, Arecibo, Adjuntas.

Chrysotus inermis Aldrich

Van Duzee (in Curran) 28-28: at Mayagüez.

AMC: at Mayagüez x-29 det. Curran.

Chrysotus longipes Van Duzee 27-1: described from eighteen speci-

mens, from Manatí, Mayagüez, Barros and Coamo Springs, P. R., "very much like *inermis* Aldrich".

Van Duzee (in Curran) 28-28: no new data.

AMC: at Cartagena Lagoon iv-31 det. Curran, Cidra x-32, Hormigueros vi-31, Mayagüez vi-32, viii-32.

Chrysotus minuticornis Van Duzee 27-3: TYPE from Naguabo, P. R.

Van Duzee (in Curran) 28-28: no new data.

Chrysotus morrisoni Van Duzee

Van Duzee (in Curran) 28-29: at Aibonito, Coamo Springs, Naguabo, Barros, Arecibo.

Chrysotus picticornis Loew

Van Duzee (in Curran) 28-27: at San Juan, Adjuntas and Coamo.

swept from weeds at Naguabo (I No. 4293 det. J. M. Aldrich).

Gymnopternus sp.—det. C. T. Greene

from weeds at Caguas (I No. 4283).

Diaphorus simplex Aldrich

Van Duzee (in Curran) 28-29: at Aibonito, Caguas and Mayagüez.

Asyndetus interruptus Loew

Van Duzee (in Curran) 28-29: at San Juan.

Asyndetus exiguus Van Duzee 27-4: TYPE from Arecibo, P. R.,

"much like *interruptus* Loew, but is smaller", etc.

Van Duzee (in Curran) 28-29: no new data.

Thrypticus fraterculus Wheeler

Van Duzee (in Curran) 28-30: at Naguabo.

Thrypticus violaceus Van Duzee 27-5: TYPE from Arecibo, P. R.

Van Duzee (in Curran) 28-30: from Aibonito, Coamo Springs and on Mona Id.

Plagioneurus univittatus Loew

Van Duzee (in Curran) 28-30: at Cayey.

AMC: at Cartagena Lagoon ii-30 det. Curran, v-31. ix-30, San Germán xii-32, Ciales xi-27, Salinas iii-27, Sabana Grande xii-27, and many from Mayagüez.

at Guayama (I No. 5004). at Añasco (I No. 2287).

Paraclius femoratus Aldrich

Van Duzee (in Curran) 28-30: at Mayagüez.

Paraclius filifer Aldrich

Coquillett: from Vieques Id.

Pelastoneurus aequalis Van Duzee 27-5: TYPE from Adjuntas, P. R.

Van Duzee (in Curran) 28-30: no additional data.

Pelastoneurus fasciatus Roeder 85-340: TYPE from P. R.

Gundlach "observado solamente en Puerto Rico".

Mesorhaga albiciliata Aldrich—det. J. M. Aldrich

at Guánica (458-14).

Condylostylus (Sciapus) graenicheri Van Duzee

(as *Psilopus caudatus* Wiedeman—det. J. M. Aldrich) Wolcott 24-23 (after IP-216): eaten by *Anolis krugi*.

(as sp.) Danforth 26-90: eaten by P. R. Mango.

(as *Sciapus*) Van Duzee (in Curran) 32-33: at La Tortuguera, El Yunque, Jayuya, Arecibo, Mayagüez and Coamo Springs; synonymy.

AMC: at Yauco ii-31 det. Curran, Joyuda iv-31 det. Curran, Mayagüez viii-32, Río Piedras vi-32, v-32.

Sciapus albiciliatus Van Duzee 27-9 and 10 (as **Psilopus**): (TYPE from St. Thomas), others from San Juan and Mona Id.
Van Duzee (in Curran) 32-33: no additional data.

Sciapus chrysoprasius Walker
(as *Psilopus*) Roeder. Gundlach.
(as *Psilopus ciliipes* Aldrich—det. J. M. Aldrich, not in synonymy) IP-216: (37-17), in grapefruit grove at Vega Alta 107-17).
Van Duzee (in Curran) 28-32: synonymy; at Corozal, Naguabo.
in grapefruit grove at Añasco (I No. 4153).

Sciapus diffusus Wiedemann
(as *Psilopus*) Roeder. Gundlach. IP-216.
(as *Condyllostylus*) AMC: at Mayagüez ix-30 det. Curran, Ponce vi-32, Río Piedras v-32.
Van Duzee (in Curran) 28-32: at many localities.
(I No. 907); resting on eggplant at Manatí (I No. 610);
resting on orange at Arecibo (I No. 1922 Leonard 33-133);
at Mameyes (I No. 2265, 2266).

Sciapus digitatus Van Duzee
Van Duzee (in Curran) 28-32: at Cayey.

Psilopus dimidiatus Loew
Roeder. Gundlach.

Sciapus dorsalis Loew
Van Duzee (in Curran) 28-32: at Manatí, Aibonito, Arecibo.

Sciapus flavicornis Aldrich
Van Duzee (in Curran) 28-32: at San Juan.

Psilopus jucundus Loew
Roeder.
in lima bean field at Vega Baja (I No. 1665).

Sciapus leonardi Van Duzee
Van Duzee (in Curran) 28-32: at La Tortuguera, Aibonito, Adjuntas.

Psilopus longicornis F.
Coquillett.

Psilopus mundus Wiedemann
(as *Psilopus ciliatus* Loew—det. J. M. Aldrich) at Corozal.

Sciapus nubilipennis Van Duzee 27-7 (as *Psilopus*); TYPE from Adjuntas, P. R.
Van Duzee (in Curran) 28-31: generic transfer.

Psilopus pilosus Loew
Roeder. Gundlach.

Psilopus portoricensis Macquart, Hist., Nat. Dipt., I, 450; Dipt. Exot., II, 2, 121; Suppl., I, 120, pl. xi, f. 17.
on pepper at Loíza (I No. 3552).

Sciapus pruinus Coquillett
Van Duzee (in Curran) 28-33: at Aibonito, Adjuntas.
at Maricao (I No. 2264 as *Psilopus*).

Psilopus psittacinius Loew
Roeder. Gundlach.

Sciapus spinimanus Van Duzee 27-6: TYPE from "Sánchez, P. R."
Van Duzee (in Curran) 28-32: no additional data.

Sciapus unicinctus Van Duzee
Curran 31-11: from Dorado (W. A. Hoffman).

EMPIDIDÆ

Phoneustica flavida Williston
(as *Drapetis*) Coquillett. IP-217.
Curran 28-25: at Mayagüez and Coamo Springs.
AMC: at Cartagena Lagoon iii-31 det. Curran.

Drapetis gilvipes Loew
Curran 28-25: at Cayey.

Syneches pusillus Loew
Curran 28-25: at Barros.

Hybos electus claripennis Curran 28-25: TYPE of variety from Adjuntas, P. R., "the wings wholly hyaline".
Melander, A. L., Trans. Ent. Soc. Amer., Vol. 28, p. 247. Columbus, Ohio, 1902: mentioning but not naming the variety.

Hybos subjectus Walker = **H. triplex** Walker
Coquillett.

Hybos spinosus Curran 28-25: TYPE from Adjuntas, P. R., differs from *triplex* Walker "by the largely pale anterior legs and different genitalia".

Euhybos spiniger Melander, A. L., "Diptera. Empididae." Genera Insectorum, Fasc. 185, p. 32. Brussels, 1927: TYPE from Utuado, P. R.
"Curran thinks this may be the same as his *E. spinosus*." M. D. Leonard.

PHORIDÆ

Aphiochaeta aurea Aldrich
Coquillett.

Aphiochaeta macrochaeta Malloch
Van Z.

Aphiochaeta picta Lehmann—det. J. M. Aldrich
from dead *Belostoma* adults (1049-16).

Aphiochaeta subflava Malloch
Van Z.

Megaselida (Aphiochaeta) scalaris Loew—det. J. R. Malloch
Curran 28-43: from Mona Id.

AMC: at Mayagüez, as *Aphiochaeta* det. Curran; others, unlabeled as *Megaselida* det. Greene.

from dead May-beetle at Fajardo (526-12), from dead termites (163-21 det. Greene); from dead insects (1049-16, 1050-16); from hot pepper fruit at Arroyo (I No. 4097-B); at Bayamón (I No. 2694): from rotten papaya fruit at Arecibo (I No. 5110-G as "sp."); (I No. 5147 as "sp.").

Conicera latimana Malloch, J. R., "A New Species of *Conicera* from Porto Rico". Proc. Wash. Ent. Soc., Vol. 26, No. 4. p. 73. Washington, D. C. April 1924: TYPE from Ciales. P. R. (as *Conicera aldrichii* Brues) Wetmore 16-74, eaten by hummingbird, *Anthracothorax aurulentus*.

Dohrniphora venusta Coquillett—det. C. T. Greene
from dead termites, *Nasutitermes morio* Latr., (126-21); from decaying bean pods (590-17—det. Malloch); from dead insects (1051-16).

Puliciphora borinquensis Wheeler, Wm. M., "A New Wingless Fly from Porto Rico," Bull. 12, Amer. Mus. Nat. Hist. Article 14. pp. 267-271, pl. 34. New York, 1906.

Syneura cocciphila Coquillett—det. C. T. Greene
Leonard 32-1106: on cottony cushion scale.
Brues, C. T., "Notes on some Tropical Phoridae". Psyche, Vol. 39, No. 4, pp. 139-144. Boston, December 1932: the same data.

Wolcott & Seín 33-213 to 214: on cottony cushion scale, TYPE from Mexico, also common in Cuba. EEWI-400 to 401: the same data.

reared from *Icerya purchasi* Maskell at San Juan (131-32, I No. 2138, 225), at Palo Seco (I No. 2139).

SYRPHIDÆ

Baccha capitata Loew

Roeder. Gundlach. Van Z. (5035) on *Aphis* sp.

AMC: at Mayagüez ix-20.

with *Saissetia hemisphaerica* Targ. at Comerío (883-13).

Baccha clavata Fabricius

Roeder. Gundlach. Coquillett. Van Z. (P. R. 88).

Wolcott 22-7: short account, life-history, predaceous on aphids. Illustrations of larva, puparium and adult.

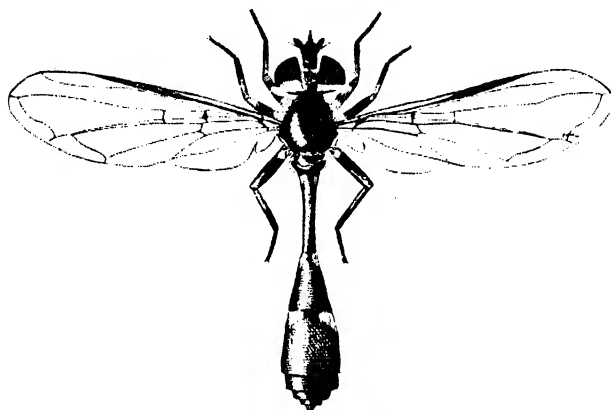
Wolcott 24-54: feeding on nectar from coffee flower and ovipositing.

Curran 28-35: at Arecibo.

AMC: at Coamo iii-23, Hormigueros vi-32, San Germán xii-33, Ponce vi-31, Algarrobo ii-31, Río Piedras vi-32 ii-32 det.

Curran, Añasco x-30, Mayagüez xii-32, etc.

(I No. 2706); resting on corn at Barceloneta (I No. 3294);



Baccha olavata Wiedemann. Six times natural size.
(Drawn by G. N. Wolcott.)

larvae feeding on aphids on okra (573-12), on *Aphis nerii* Boyer on milkweed (438-12), on *Toxoptera aurantiae* Boyer on grape-fruit (234-17), on *Aphis gossypii* Glover on cucumber (65-16), on *Macrosiphum illinoiense* Shimer on *Cissus sicyoides* (429-21), on grape (45-25).

***Baccha (Ocyptamus) conformis* Loew**

Roeder. Gundlach. Van Z. (P. R. 1207).

on mango blossoms at Mayagüez (I No. 3825).

***Baccha cylindrica* F.**

Curran 28-36: at Arecibo, Mayagüez, El Yunque and on Mona Id.

AMC: at Mayagüez i-30 det. Curran, iv-32, Las Marías xii-32, Lares xii-32, Ponce xii-33, Cabo Rojo xii-32, Aguadilla xii-33, Algarrobo iii-31, Coamo vi-32, Río Piedras vi-32, v-32.

***Baccha dimidiata* F.**

Curran 28-36: at Aibonito, Cayey, Mayagüez (I No. 3813); on pepper leaf at Barceloneta (I No. 3462).

***Baccha (Ocyptamus) fasciatus* Roeder 85-342: TYPE from P. R.**

Gundlach, "observado solamente en Puerto Rico".

larvae feeding on aphids, *Toxoptera aurantiae* Boyer, on coffee, mountains north of Yauco (413-21), on *Aphis nerii* Boyer on milkweed at Yauco (59-22).

Ocyptamus fascipennis Say—det. C. T. Greene

(I No. 2707), at Dorado (I No. 5674).

Baccha gracilis Williston

Curran 28-35: from El Yunque.

Baccha incompta Austen

Curran 28-36: at Adjuntas.

Baccha (Ocyptamus) latiusculus Loew

Roeder. Gundlach. Coquillett.

(as *Ocyptamus* sp.) Jones 15b-14: description of stages, as predator on *Sipha flava* Forbes on sugar cane. Colón 19-29. AMC: at Utuado viii-30. San Germán xii-32, Ponce i-31, Salinas xii-33, Las Marías xii-32, Algarrobo ii-31, Coamo vi-32, vii-32, Río Piedras v-32, vi-32, and many dates at Mayagüez.

larvae feeding on aphids, *Toxoptera aurantiae* Boyer, on grapefruit (38-17, 109-17, 392-12), on coffee in mountains north of Yauco (413-21); on *Sipha flava* Forbes on sugar cane (662-12); on *Aphis nerii* Boyer (438-12), at Yauco (56-22); on *Aphis gossypii* Glover on cucumbers (78-16); on *Aphis maidis* Fitch on corn (799-17); feeding on water-lily aphid (95-24); adult on pepper leaf at Manatí (I No. 613).

Baccha ornatipes Curran 27-3, fig. of leg: TYPE from Cayey, P. R.

Curran 28-35: no new data.

Baccha parvicornis Loew

Roeder. Gundlach.

AMC: at Coamo vi-32, Utuado viii-30, Luquillo vi-32 and many dates at Mayagüez.

(I No. 2509); apparently from nymphs of a Fulgorid, *Ormenis pygmaea* Fabr., on coffee leaf (190-21); from whiteflies on *Inga laurina* in plaza at Cabo Rojo (505-18); from leaf of *Erythrina glauca* infested with mealybugs, *Pseudococcus nipae* Mask. (70-23); in mango grove at Mayagüez (I No. 4346); at Peñuelas (I No. 5576).

Baccha stenogaster Williston—det. C. T. Greene

Curran 28-35: from Adjuntas, Coamo.

AMC: at Mayagüez iv-30 det. Curran.

from mealybugs, *Phenacoccus gossypii* T. & C., on cotton at Maunabo (72-22); from *Pseudococcus longispinus* on *Solanum vendlandii* (50-33).

Mesogramma (Toxomerus) arcifera Loew

Coquillett. Van Z. (P. R. 109).

Curran 28-41: at many localities.

AMC: at Mayagüez iii-30 det. Curran, and on many other dates and at many other localities.

swept from grass (76-12), at Manatí and Corozal (GNW); on mango blossoms at Mayagüez (I No. 2677, 3814, 3816, 3950).

Mesogramma (Toxomerus) aurulentus Williston—det. C. T. Greene

AMC: at Luquillo vii-32.
from Aibonito (SSC).

Toxomerus basilaris Wiedemann—det. C. L. Metcalf

swept from grass at Coloso, Caguas, Manatí, and Pt. Can-
grejos (GNW).

Toxomerus boscii Macquart

(as *Mesograptus*) Stahl. Roeder. Gundlach.

Mesogramma duplicata Wiedemann

Curran 28-38: at many localities.

Mesogramma florale F.

Curran 28-39: at many localities.
AMC: at Cidra ii-32 det. Curran.

Toxomerus laciniosus Loew

Roeder. Gundlach. Coquillett.

Wolcott 24-30: eaten by *Anolis pulchellus*.

(as *Mesogramma laciniosa* Loew) Curran 28-39: "I have seen
specimens labeled Porto Rico."

AMC: at Mayagüez xii-30 det. Curran, and at many other
localities.

common, swept from grass at Caguas, Ciales, and Manatí—
det. Metcalf (GNW); on tobacco at Garrochales (I No. 5379);
at Mayagüez (I No. 2673, 2674).

Toxomerus minutus Wiedemann

(as *Mesograptus*) Gundlach, "rara en Puerto Rico".

Mesogramma musicus F.

Curran 28-39: at Corozal.

Mesogramma picta Macquart

Curran 28-41: at Aibonito, Corozal.

AMC: at Añasco x-30 det. Curran, and at many other localities.

Toxomerus politus Say—det. R. T. Cotton

Cotton 18-291: "Corn Feeding Syrphid Fly"—"very abundant
on corn and some of the native wild grasses. The yellowish
colored grubs feed on pollen grains and on the saccharine cells
in the axils of the leaves. The grubs pupate between the stalk
and the leaf-sheath.—parasitic enemies numerous."

EEP-43: on corn.

(as sp.) Wolcott 24-31: eaten by *Anolis cristatellus*.

Curran 28-38: mention as *Mesogramma polita*.

EEWI-248: quoting Cotton.

AMC: at many localities (as *Mesogramma polita* Say det.

Curran, at Mayagüez ix-30).

larvae feeding on pollen of corn (578-17, 597-17).

Toxomerus polygonastyla sp. nov., ms. name of C. P. Metcalf, "because of the peculiar shape of the styles on the male".
puparia common on tobacco at Cayey (114-21), larvae possibly feed on small insects becoming stuck on leaves.

Toxomerus subannulatus Loew

Coquillett.

larvae on cane infested with *Sipha flava* Forbes (732-12); feeding on *Rhopalosiphum persicae* Sulz. on peppers (34-17); adults swept from grass at Caguas and Ciales (GNW); at Mayagüez (I No. 2678), on cucumbers (I No. 3314).

Mesogramma verticalis Curran 27-6: TYPE from Cayey, P. R.

Curran 28-38: no new data.

Mesogramma violacea Curran

Curran 28-39: at numerous localities.

Allograpta fuscisquama Curran 27-4: TYPE from Ensenada, P. R., another from Mona Id.

Curran 28-37: no new data.

AMC: at Yauco iii-29 det. Curran, Utuado xii-32, Villalba ii-30, Coamo vi-32, vii-32, xii-32, Ilumacao xii-33, Río Piedras iv-30, vi-32.

Allograpta limbata Fabr.—det. C. T. Greene

larvae on cane infested with *Sipha flava* Forbes (710-12); larvae and pupae in arrows of sugar cane (81-19, 127-22, 60-23), at Cidra (29-21).

Volucella esuriens Fabr.

Roeder. Gundlach.

Volucella obesa Fabr.

Stahl. Roeder. Gundlach, "sumamente común en los montes". Van Z. (P. R. 92).

Danforth 26-92, 122: eaten by P. R. Tody and Northern Water Thrush.

Curran 28-41: at many localities.

AMC: many localities.

(I No. 904); at Añasco 1009-13), at Naguabo (734-14), at Arecibo (I No. 1918).

Volucella pallens Wiedemann

(as *V. sexpunctata* Loew) Stahl. Roeder. Gundlach.

Van Z. (P. R. 1204).

Curran 28-42: on El Yunque.

AMC: many localities.

on flowers of *Cordia* (645-12, 225-13 det. Greene); resting on leaf of almendra at Arecibo (I No. 1481 Leonard 33-137),

on orange fruit at Peñuelas (I No. 1953, 2668), on *Crotalaria* at Arecibo (I No. 3644), on achiote at Arecibo (I No. 4943), on grapefruit at Arecibo (I No. 5363).

Volucella pusilla Macquart
Roeder. Gundlach.

Volucella tricineta Bigot—det. C. T. Greene
at Bayamón (I No. 5545).

Volucella unipuncta Curran, C. H., Ann. Ent. Soc. Amer., Vol. 19,
p. 63. 1926: TYPE from Desecheo Id. and Ensenada, P. R.
Curran 28-42: no new data.
AMC: at Coamo vi-32.

Volucella sp. nov.—det. C. H. Curran
AMC: at Maricao xii-30, San Germán xii-33, Coamo xii-32,
vi-32.

Eristalis albiceps Macquart—det. C. T. Greene
Wetmore 16-87, 89, 99: eaten by Swallow, Martin and Redstart.
at Loíza (I No. 5143).

Eristalis albifrons Wiedemann
Roeder. Gundlach.
Curran 28-42: on El Yunque.
in lima bean field at Pueblo Viejo (I No. 3852).

Eristalis atrimanus Loew—det. C. T. Greene
Curran 28-43: at Aibonito.
AMC: many records.
on *Cordia* flowers (644-12). on flowers near the beach at
Pt. Cangrejos (605-17); resting on cane at Yauco (238-21).

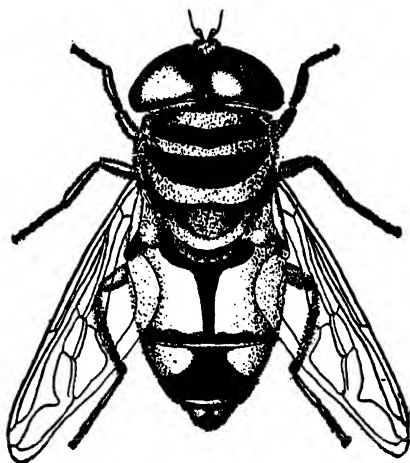
Eristalis cubensis Macquart
Curran 28-43: at Manatí.

Eristalis hortorum F.—det. C. T. Greene
AMC: at Coamo viii-32.
at Ponce (I No. 5567), in grapefruit grove at Mayagüez
(I No. 4162), at Dorado (I No. 4938).

Eristalis pusio Wiedemann
Roeder. Gundlach.

Eristalis vinetorum Fabr.
Stahl. Roeder. Gundlach.
Curran 28-42: at many localities.
Van Z. (P. R. 96).
AMC: many localities.
on flowers at Aibonito (574-16), at Arecibo (442-13), at
Añasco (1027-13), at Ponce (116-13); on flowers of yellow

caltrop, *Tribulus cistoides*, at Puerta de Tierra, before 9 A. M. after previous rain (16-34); (I No. 915); in swamp



Eristalis victorum F. Four times natural size. (Drawn by F. Maximilien.)

at Pt. Cangrejos (I No. 5473); on grapefruit at Bayamón (I No. 5340); on *Crotalaria* flowers at Arecibo (I No. 3645, 3646).

***Meromacrus (Pteroptila) cinctus* Drury**

Roeder. Gundlach.

AMC: at Jayuya ix-30, iv-29 det. Curran, Hormigueros vii-32, Río Piedras i-32.

Van Z. (P. R. 616).

at Adjuntas (I No. 5577).

***Meromacrus (Pteroptila) pratorum* Fabr.**

Roeder. Gundlach.

***Xylota pachymera* Loew**

Roeder. Gundlach.

CONOPIDÆ

***Conops pictus* Fabr.**

Roeder. Gundlach.

***Zodion nanellum* Loew**

Roeder. Gundlach.

PIPUNCULIDÆ

***Pipunculus regalis* Curran 28-43: TYPE from Mayagüez, P. R., "Black----length 2.25 mm."**

GASTEROPHILIDÆ

Gasterophilus nasalis L. (= *verterinus* Clark)

Van Volkenberg 35-23: infestations mild in native or acclimated horses.

Hoffman: found in alimentary canal of horse by Dr. Meléndez at Río Piedras, by Dr. van Volkenburg at Mayagüez, and by W. A. H. near Coamo in 1934. Apparently established in P. R.

TACHINIDÆ

Curran, C. H.,

"New West Indian Tachinidae". Amer. Mus. Novitates No. 260, pp. 15, fig. 5. New York, March 19, 1927.

Gymnosoma filiola Loew = **G. fuliginosa** Desvoidy

Roeder. Gundlach.

Compsilura oppugnator Walton, W. R., "Four New Species of Tachinidae from North America" In Proc. Wash. Ent. Soc., Vol. 16, No. 2, pp. 93-95, June, 1914: from *Cirphis latiuscula* H. S. (88-12 TYPE).

Jones 14-462; Jones & Wolcott 22-44.

Trichopoda flava Roeder 85-343: TYPE from P. R.

Gundlach, "Parece ser propia de la isla".

Trichopoda haitensis Desvoidy

Curran 28-113: at Mayagüez.

AMC: at Mayagüez ii-30 det. Curran, xii-32, Río Piedras xii-32, i-32, Utuado xi-30, San Germán xii-32, Coamo vi-32.

Trichopoda pennipes Fabr.

(as *T. pyrrhogastra* Wied.) Roeder. Gundlach.

(as *T. pyrrhogaster* Wied.) Van Z. (P. R. 104).

Dozier 26-116: reared from *Coreocoris batatae*.

reared from *Coreocoris batatae* (105-24); reared from *Nezara viridula* at Isabela (GNW).

Acronarista mirabilis Townsend

Curran 28-113: at Barros.

Sciasma nebulosa Coquillett

Curran 28-114: at Caguas and Aibonito.

Comyopsis fumata Townsend—det. J. M. Aldrich

at Mayagüez (I No. 3072).

Lydella incompleta Curran—det. J. M. Aldrich

reared from guava fruits at Bayamón (I No. 3399).

Eucelatoria armigera Coquillett—det. J. M. Aldrich

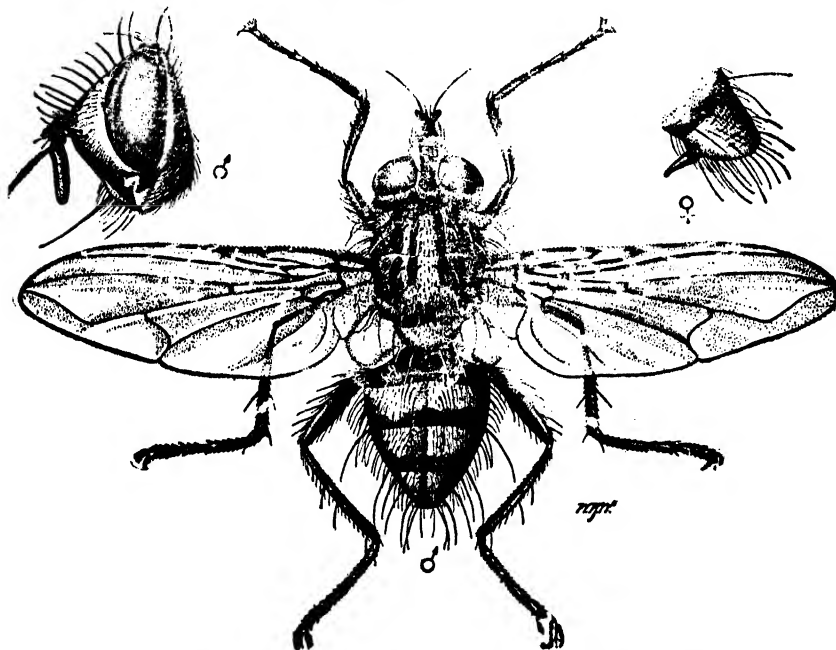
in string beans at Bayamón (I No. 3447).

Eucelatoria australis Townsend—det. J. M. Aldrich
in mango grove at Mayagüez (I No. 4343).

Clausicellana mitis Curran (AMN No. 260) 27-12: TYPE from
Aibénito, P. R.
Curran 28-111: no new data.

Comatacta insularis Curran (AMN No. 260) 27-12: TYPE from
San Juan, other from Manatí, P. R.
Curran 28-112: key to species.

Prorhynchops errans Curran (AMN No. 260) 27-13, fig. of head:
TYPE from Manatí, others from Arecibo, Caguas and Aibénito, P. R.
Curran 28-112: no new data.



Cryptomeigenia aurifacies Walton. Ten times natural size.
(Drawn by W. R. Walton.)

Cryptomeigenia aurifacies Walton, W. R., "A New Species of Tachinidae from Porto Rico" *In* Proc. Ent. Soc. Wash., Vol. 14, No. 4, pp. 198-200, pl. x, Jan. 10, 1912.

(as sp.) Van Dine 12-18.

Van Dine 13-29; Van Dine 13-254; and Van Dine 13a-37: the latter the more complete account of rearing this parasite of *Lachnosterna* beetles from Añasco.

Van Z. (P. R. 5060).

Smyth 17-56, 86 to 87, 151: "The number of pupae found within one dead adult host varies from two to nine, usually four to six. Infested beetles that have died are always found in their burrows in the ground." Illustrations of adult and empty puparium.

Colon 19-50.

Wolecott 24-6: mention.

EEP-27 (fig.) & EEWI-117 (fig.): method of attack and importance as parasites of May beetles.

Wolecott 34-103: W. F. Jepson sent to P. R. in search for.

Wolecott 34-431: only 1% of parasitism at Cidra found by W. F. Jepson.

from adults of *Lachnosterna vandinci* Smyth and *L. portoricensis* Smyth at Añasco (356-12 TYPE, 519-12), at Pueblo Viejo (909-14), and generally throughout the moister portion of the island; only 1% of beetles at Guaynabo and Cidra attacked (33-33, 37-33).

Hypostena vanderwulpi Townsend

Coquillett.

Lixophaga (Euzenillioptis) diatraeae Townsend—det., adults by J.

M. Aldrich, pupae by C. T. Greene.

(as *Tachinophyto* sp.) Van Dine 13-254; Van Dine 13-29: parasite of *Diatraea saccharalis* Fabr.

(as *Hypostena* sp.) Van Dine 12-17. Jones 15c-15.

(as *Tachinophyto* sp.) Van Z. (P. R. 5019) from *Diatraea saccharalis* Fabr.

(as *Tachinophyto* sp. and *Hypostena* sp.—not in synonymy)

Colón 19-41 and 42.

Earle 28-166: as a parasite of the moth borer.

EEP-19: a parasite on the caterpillar of *Diatraea saccharalis*.

Wolecott 24-92: attempted introduction by H. E. Box into Demerara.

Box, H. E., "Report upon a Trip to Puerto Rico, April-July, 1924." (for Private Circulation) S. Davson & Company Ltd., pp. 22. Berbice, British Guiana, November 1924: collections of pupae of the fly and parasitized *Diatraea* larvae made from borer "dead-hearts" between Trujillo Alto and Río Piedras, sent to Demerara in two shipments: the first of 96 pupae, from which 35 flies emerged at Plantation Blairmont, the second of 149 pupae, (collected mostly between Bayamón and San Patricio) from which 54 flies emerged at destination.

Box, H. E., "Observations upon *Lixophaga diatraeae* Townsend, A Tachinid Parasite of *Diatraea saccharalis* Fabr., in Porto Rico". Bull. Ent. Research, Vol. 19, Pt. 1, pp. 1-6, ref. 11, fig. 1. London, August 1928: an extended account. "The writer does not think that the efficiency of *Lixophaga* can be artificially increased (in Porto Rico) in any way, as it seems that this parasite has reached its maximum effectiveness, there

being a state of natural equilibrium maintained between it and its host." A distinct seasonal variation: in February and March 1925 average parasitism 12% (maximum 23%), during October and November 1926, average 37% (maximum 63%).

(the more recent of Mr. Box' papers deal with the introduction of this parasite from Cuba into Barbados, Antigua and St. Kitts.)

Leonard 33-135: note.

LEEWI-178: distribution and economic importance.

pupae found in tunnels of *Diatraea saccharalis* Fabr. (175-11, 217-11, 208-12, 904-13) reared from larvae of *Diatraea* (630-17, 694-17): on banana leaves at Guayama (I No. 5012).

Lixophaga sp. nov.—det. J. M. Aldrich
at Mayagüez (I No. 4557).

Tachinophyto floridensis Townsend
Curran 28-111: at Adjuntas.

Plagiprospherysa occidentalis Wiedemann
Curran 28-111: at Aibonito.

Eutrixoides jonesii Walton, W. R., "New North American Tachinidae (Diptera)" *In* Ent. News, Vol. 24, No. 2, pp. 49-52, pl. 1, Feb. 1913.

Van Dine 13-254; Van Dine 13-29 and Van Dine 13a-37: the latter the more complete account.

Smyth 17-56 and 151.

Colón 19-51.

Wolcott 24-6: mention.

EEP-27: an enemy of May beetles.

EEWI-117: much less abundant than *Cryptomeigenia aurifacies*.

Wolcott 34-103: W. F. Jepson sent to P. R. in search of.

Wolcott 34-436: not found by W. F. Jepson in 1933.

from adults of *Lachnosterna vandinei* Smyth and *L. portoricensis* Smyth in the the moister portions of the island, at Añasco (454-12 TYPE, 483-12, 504-12), less abundant than *Cryptomeigenia aurifacies*.

Stomatodexia cothurnata Wiedemann

(as *Leskia analis* Say) Van Z. (P. R. 5055) from *Diaphania hyalinata* Linn.

Curran 28-114: in mountains.

Curran 31-23: synonymy, at Cidra.

Epigrimyia townsendi Curran 31-22: TYPE from Isabela, P. R.

Leskiopalpus sp.—det. J. M. Aldrich

at Mayagüez (I No. 5159), resting on Croton at Bayamón (I No. 4407).

- Beskia aelops** Walker—det. J. M. Aldrich
AMC: at Río Piedras i-32 det. Curran.
(I No. 916).
- Phaenopsis** sp.—det. J. M. Aldrich
in grapefruit grove at Añasco (I No. 4156).
- Cyrtoneurina** sp.—det. J. M. Aldrich
on sour orange at Mayagüez (I No. 4239).
- Mericina ruficauda** Curran (AMN No. 260) 27-6: TYPE from Are-
cibo, P. R.
- Ricosia setigena** Curran (AMN No. 260) 27-5, fig. of head: TYPE
from Aibonito, P. R.
- Belvosia bifasciata** Fabr.
Stahl. Roeder. Gundlach.
AMC: at Yabucoa vi-30 det. Curran, Mayagüez ix-30 det.
Curran.
EEP-125 and EEWI-643: the following data.
from pupae of *Herse cingulata* Fabr. at Hatillo (518-18).
- Belvosia insularis** Curran (AMN No. 260) 27-4: TYPE from Ba-
rros, P. R.
Curran 28-107: no new data.
- Belvosia luteola** Coquillett 00-253: TYPE from Vieques Id.
- Belvosia piurana** Townsend—det. C. H. T. Townsend
on flowers (639-12).
- Ocyptera atra** Roeder 85-344: TYPE from P. R.
Gundlach.
- Ocyptera minor** Roeder 85-344: TYPE from P. R.
Gundlach.
(as *Cylindromyia*) Curran 28-114: synonymy; at Coamo
Springs. AMC: at Coamo iii-29 det. Curran, Boquerón ii-30.
- Nemorilla florialis** Fall—det. J. M. Aldrich
at Mayagüez (I No. 3919).
- Nemorilla maculosa** Macquart = **Exorista pyste** Walker—det. J. M.
Aldrich.
from pupa of *Diaphania hyalinata* Linn. (489-16); reared
from *Tetralopha scabridella* Ragonot at Cayey (385-22 det.
J. M. Aldrich).
- Euphorocera claripennis** Macquart—det. W. R. Walton
Jones & Wolcott 22-49.
from larvae of *Remigia repanda* Fabr. at Santa Isabel (7-
12); at Mayagüez (I No. 3912 as *Ebenia*).
- Phorocera parviteres** Aldrich—det. J. M. Aldrich
reared from larvae of *Pieris monuste* L. at Yauco (77-23);
from *Melanchroia cephiæ* Cramer (6-24 as "sp.").—from
IPSup-41.

Phorocera divisa Aldrich & Webber, Proc. U. S. Nat. Mus., Vol. 63, Art. 17, p. 55. Washington, D. C., 1924: TYPE from P. R. Curran 28-109; no new data.

Exorista amplexa Coquillett—det. J. M. Aldrich
from larvae of *Epantheria eridanus* Cramer (560-16).

Exorista tassellatta Roeder 85-345: TYPE from P. R. Gundlach.

Frontina aletiae Riley—det. J. M. Aldrich
from larva on *Inga laurina* at Lares (58-22).

Frontina archippivora Williston—det. W. R. Walton
Van Dine 13-31; Van Dine 13-257; Jones 13-235; Jones & Wolcott 22-47: as parasite of *Laphygma frugiperda* S. & A.
from *Laphygma frugiperda* S. & A. (74-12, 83-12, 84-12, 90-12, 738-12, 558-17, 585-17, 609-17), at Mameyes (822-12), at Arecibo (216-11), from pupa at Sabana Grande (444-21).

Frontina bigeminata Curran (AMN No. 269) 27-9: TYPE from Adjuntas, P. R.

Frontina insularis Brauer & Bergenstamm
Curran 28-110: at Barros.
AMC: at Río Piedras iv-31 (as *Achaetoneura*) det. Curran, Faro de Cabo Rojo xi-30, Carmen i-32, Yauco xi-29, Hormigueros vi-32. Luquillo viii-31. Barranquitas i-23, and many dates at Mayagüez.

Frontina ruffrons Roeder 85-346: TYPE from P. R.

Zygosturmia sp.—det. J. M. Aldrich
from Sphinx larva on *Cordia* (473-13).

Sturmia (Argyrophylax) albincisa Wiedemann—det. Walton & Townsend.

Cotton 17-113: from larvae of *Pachyzancla periusalis* Walker on tobacco.

Colón 19-36.

EEP-91: a parasite of the "pega-pega" of tobacco.

EEP-108: a parasite of the "pega-pega" of beans.

Curran 28-110: at Mayagüez.

from larvae of *Pachyzancla periusalis* Walker (215-12, 797-16, 798-16, 957-16, 968-16, 88-19); from pupa of *Zinckenia perspectalis* Fabr. (1132-16); from *Nacoleia indicata* Fabr. (38-12); from *Mesoncondyla concordalis* Hübner (741-14); at Bayamón (I No. 5157), at Mayagüez (I No. 5160); resting on squash (I No. 3400, 3522); on grapefruit at Cidra (I No. 4144), at Dorado (I No. 4184, 4937); on banana leaves at Guayama (I No. 5011, 5014, 5010); on mango blossoms at Mayagüez (I No. 3824, 3917).

Argyrophylax sp. nov.—det. J. M. Aldrich
(I No. 3356).

Erycia consistens Curran (AMN No. 260) 27-10: TYPE from Coamo Springs, P. R.
Curran 28-110: no new data.

Anacamptomyia americana Curran (AMN No. 260) 27-8, fig. of head: TYPE from Mayagüez, P. R.

Ormia dominicana Townsend
(as *O. punctata* Desvoidy) Roeder. Gundlach. IP-225: at Pt. Cangrejos (GNW), at Aibonito (575-16 det. J. M. Aldrich.)
Curran 31-23: at Coamo Springs.

Linnaemyia fulvicauda Walton 14-93: TYPE from P. R.
Jones 14-462; Jones & Wolcott 22-49: from *Remigia repanda* Fabr.
Curran 28-108: at Aibonito.
AMC: det. J. M. Aldrich.
from *Remigia repanda* Fabr. (109-12 TYPE), at La Plata, Cayey (131-12), at Aibonito (SSC).

Blepharipeza jurinoides Townsend—det. J. M. Aldrich
(unlabeled specimens.)

Blepharipeza leucophrys Wiedemann
Gundlach.
(many unlabeled specimens, poss. from dead mouse (759-17).)

Parachaeta bicolor Macquart
(unlabeled specimens, poss. from dead mouse (759-17).)

Winthemia okefenokeensis Smith
Curran 28-108: at Manatí, Caguas.

Winthemia quadripustulata Fabr.—det. J. M. Aldrich
from pupa of Noctuid on sugar cane at Ponce (144-12).

Winthemia sexualis Curran (AMN No. 260) 27-7: TYPE from Arecibo, Adjuntas, P. R.
Curran 28-109: no new data.

Gonia sp.—det. J. M. Aldrich
from *Anticarsia gemmatilis* Hübner (877-14, 878-14).

Gonia angusta Macquart
Van Z. (P. R. 103) from *Lachnosterna* spp.

Gonia crassicornis Fabr.
Van Dine 13-31; Van Dine 13-257; Jones 13-235; Jones & Wolcott 22-47: from *Laphygma frugiperda* S. & A.

(450-12, 559-12); from *Laphygma frugiperda* S. & A. at Arecibo (8-12); reared from *Xylomiges eridania* on potato at Cidra (I No. 1853-C Leonard 33-137); on cucumber leaf at Caguas (I No. 5054); at Manatí (I No. 4400), at Guánica (I No. 1655).

Gonia pallens Wiedemann

Roeder.

(as *Gonia chilensis* Macq.) Gundlach.

from *Xylomiges sunia* Guenee (762-16, 819-16).

Gonia texensis Reinhard

Curran 28-107: at Coamo, Manatí.

Gonia sororia Reinhard

AMC: at Cabo Rojo xi-30 det. Curran, Jayuya xii-32, La Plata xii-26, Mayagüez 1924, vii-31.

Peleteria robusta Wiedemann

(as *Echinomyia*) Roeder. Gundlach.

Archytas analis Fabr.—det. J. M. Aldrich

from cutworm on tobacco at Aibonito (187-12).

Archytas antillicolla Curran (AMN No. 260) 27-2, fig. of head:
TYPE from Aibonito, other from Maricao, Adjuntas, Barros, Caguas and Arecibo, P. R.

AMC: at Yabucoa vi-30 det. Curran, Hormigueros vi-32, Coamo v-32, vi-32, Mayagüez vii-32, Río Piedras v-32.
on El Yunque (I No. 2099 Leonard 33-137).

Archytas basifulva Walker

Coquillett. Van Z. (P. R. 97). Curran 28-106: at Coamo Springs.

AMC: at Coamo Springs xi-30 det. Curran, Yabucoa iii-30, Algarrobo iv-31, Joyuda xi-30, Hormigueros vi-32, and many dates at Mayagüez.

Archytas incerta Macquart—det. J. M. Aldrich

reared from caterpillars on beets at Vega Baja (I No. 3303), on peas at Cidra (I No. 3502).

Archytas piliventris V. d. Wulp—det. W. R. Walton

Van Dine 13-31; Van Dine 13-257; Jones & Wolcott 22-47; from *Laphygma frugiperda* S. & A.

Curran 28-107: at Coamo and Mayagüez.

AMC: at Cabo Rojo xi-30 det. Curran, Yauco ii-31, Cayey v-30, Río Piedras xii-30, Coamo vi-32, viii-32, Lares vii- , Jayuya xii-32, Joyuda xi-30, Mayagüez xi-30, i-32, La Plata x-27.

from pupa of *Laphygma frugiperda* S. & A. (117-12, 558-12).

Archytas (Nemochaeta) seminigra Wiedemann

(as *Jurinia analis* Macq.) Roeder. Gundlach.

Antillicolla auriceps Curran (AMN No. 260) 27-1, fig. of head:
TYPE from Adjuntas, P. R.

Dinera sp. nov.—det. J. M. Aldrich

in orange grove at Mayagüez (I No. 4245).

Opsodexia cruciata Reinhard—det. J. M. Aldrich

in mango grove at Mayagüez (I No. 4345).

Spathidexia dunningi Coquillett

Curran 28-111: at Manatí, Mayagüez.

Spathidexia atypica Curran (AMN No. 260) 27-11: TYPE from
Adjuntas, others from Aibonito and Manatí, P. R.

Curran 28-111: no new data.

Rhynchodexia sororia Williston

Curran 28-113: many records.

Curran 31-23: at Río Piedras, probably in synonymy with
rufianalis van der Wulp.

AMC: at Barranquitas xii-30 det. Curran, Barros x-30, Río
Piedras i-32 det. Curran, vi-32.

Phorostoma (Paramytocera Rhynchodexia) rufianalis V. d. Wulp

Coquillett.

in citrus grove at Pt. Salinas (178-15); on flowers at Pt.
Cangrejos (603-17).

Dexia strenua Desvoidy

Roeder. Gundlach.

SARCOPHAGIDÆ

Johnsonia bivittata Curran 28-95: TYPE from Aibonito, P. R.

Sarcofahrtia capitata Curran 28-96 fig. of male genitalia: TYPE
from Mayagüez, P. R.

Sarcophagula occidua Fabr.

Coquillett.

Curran 28-101: at many localities.

on cattle dung (745-12—det. as *S. imbecilla* V. d. Wulp by
Knab), from weeds (24-17), on corn leaves (257-21); at
Bayamón (I No. 593), at Barceloneta (I No. 3266); on tomato
at Loíza (I No. 3901); (I No. 3846), on *Murraya exotica* (I
No. 306); resting on pepper at Guaynabo (I No. 3857), on
Melanthra (I No. 4148); at Pueblo Viejo (I No. 2876), at
Añasco (I No. 4269); on decaying cucumber at Bayamón (I
No. 4896).

Sarcophaga amoena Aldrich—det. J. M. Aldrich

(398-13), on leaves of corn (646-17); reared from injured
snail from Lares (76-22).

Sarcophaga australis Aldrich—det. J. M. Aldrich
on grapefruit at Palo Seco (I No. 3470).

Sarcophaga bakeri Aldrich

Aldrich, J. M., "Sarcophaga and Allies in North America".
Thomas Say Foundation, p. 270, Lafayette, Ind., 1916.

Curran 28-99: at many localities.

on weeds (215-17) and from Mayagüez (Van Zwaluwen-
burg, Coll.); resting on bean leaf at Loíza (I No. 1608, 5144,
5145); on corn at Barceloneta (I No. 3265), on *Chalcas*
(*Muraya*) *exotica* (I No. 3307, 3505).

Sarcophaga capitata Aldrich 16-209: TYPE from Mayagüez and
Arecibo, P. R.

Curran 28-98: at many localities.

AMC: at Mayagüez i-30 det. Curran, and many other dates,
on five dates at Coamo, two at Río Piedras.

(243-17), (I No. 3788), on sour orange at Añasco (I No.
4242).

Sarcophaga culminata Aldrich 16-289: TYPE from Mayagüez, P. R.

Curran 28-99: at many localities.

Curran 31-22: at Cidra.

on El Yunque (I No. 2100); on sour orange at Añasco (I
No. 4241).

Sarcophaga diversipes Coquillett 00-255: TYPE from P. R.

Helicobia globulus Aldrich

Curran 28-100: at many localities.

Sarcophaga heliciis Townsend

(as *Helicobia*) Coquillett. Curran 28-101: at many localities.

Jones & Wolcott 22-49:

from larva of *Remigia repanda* Fabr. at La Plata, Cayey
(123-12).

Sarcophaga (Helicobia) sp. nov.—det. J. M. Aldrich

in orange grove at Maricao (I No. 4244). at Añasco (I
No. 4277).

Sarcophaga lambens Wiedemann

Roeder. Gundlach. Coquillett.

on weeds at Barceloneta (I No. 5112, 5113) at Loíza (I No.
5146); reared from yeast (I No. 4254).

Helicobia latisetosa Parker

Curran 28-100: at many localities.

Sarcophaga prob. morionella Aldrich—det. J. M. Aldrich

on weeds at Arecibo (I No. 4397, 4398); in coffee grove at
Maricao (I No. 1253); in orange grove at Mayagüez (I No.
4908, 3951, 4555, 4558).

Sarcophaga morionella Aldrich—det. J. M. Aldrich
at Bayamón (I No. 2692); in mango grove at Mayagüez
(I No. 4341); in orange grove at Mayagüez (I No. 4811, 4813).

Sarcophaga peltata Aldrich 16–216: TYPE from Naguabo and Mayagüez, P. R.

Curran 28–98: at many localities.

AMC: at Mayagüez x–30 det. Aldrich, and many other dates, Cabo Rojo v–30, Las Marías iv–40, Ponce vi–32, Maricao i–31, Coloso vii–32, San Germán xii–32, Aguada xii–32, Yauco xii–32, ix–29, Río Piedras i–32 det. Curran.

common among weeds (19–17), around grapefruit trees (559–17), on corn leaves (255–21); at Bayamón (I No. 2687), at Barceloneta (I No. 5111); on melon leaves at Caguas (I No. 5060, 5061); on *Eugenia* at Añasco (I No. 4152); in decaying cucumbers at Bayamón (I No. 4895); in grapefruit grove at Dorado (I No. 4185, 4933); in jobo tree with ripe fruit (171–32).

Sarcophaga plinthopyga Wiedemann

Roeder. Gundlach. Coquillett.

(as *Sarcophaga robusta* Aldrich) Aldrich 16–268: from Mayagüez, P. R.

Curran 28–99: (with *robusta* Aldrich in synonymy) "Aldrich reports the species from Mayagüez".

Curran 31–22: on Vieques Id.

AMC: at Mayagüez iv–28 det. Aldrich, at Mayagüez ix–30 det. Curran, and many other dates, Añasco x–30, Yabucoa vii–30, Utuado vii–30, and Río Piedras xii–31 det. Curran, vi–32, v–32.

(I No. 2350).

Sarcophaga quadrisetosa Coquillett

Parker, R. R., "Sarcophagidae of New England". Proc. Boston Soc. N. H., Vol. 35, p. 60 (as *Ravinia*). 1914.

Sarcophaga sternodontis Townsend

Aldrich 16–267: from Mayagüez, P. R.

Wolcott 24–56: from pupa of *Alabama argillacea* at Hatillo.

Jones & Wolcott 22–49: from pupae of *Remigia repanda* Fabr. and from white grubs.

Curran 28–99: at many localities..

AMC: at Mayagüez xii–26 det. Curran, vii–22 Río Piedras v–32.

(452–12, 766–12, 717–14), from dead spider (5–14); from dead *Lachnosterna* beetles (472–12, 702–16), at Cidra (35–33), at Añasco (400–12, 445–12, 446–12, 453–12, 467–12, 488–12), at Guánica (547–13); from grubs of *Lachnosterna portoricensis* Smyth (735–17); from pupae of *Remigia repanda*

Fabr. at Guánica (657-14), at Mameyes (812-12); five adults from one pupa of *Laphygma frugiperda* S. & A. (557-17); from sphinx moth larva at Yauco (410-21); from pupae of *Alabama argillacea* Hübner at Hatillo (213-22, 214-22); from dead sphinx moth at Caguas (SSC); from dead changa, *Scapteriscus vicinus* Seudd, at Patillas (1206-13); from dead cockroach (627-21). Adults at Toa Baja (140-13), at Añasco in coffee grove (348-13), swept from grass at Morovis (GNW).

***Helicobia surrubea* Van der Wulp**

Curran 28-101: at many localities.

***Sarcophaga taurus* Aldrich—det. J. M. Aldrich**

(I No. 914).

***Harpagopyga diversipes* Coquillett**

Curran 28-101: at Coamo Springs and on Mona Id.

***Harpagopyga* sp. nov.—det. J. M. Aldrich**

at Arecibo (I No. 5054).

***Sarothromyia femoralis* Schiner**

Curran 28-101: at Santurce and Arecibo.

***Sarcophagina candida* Curran 28-102 to 103, fig. of head: TYPE from Santurce, P. R.**

***Pachyophthalmus floridensis* Townsend**

Curran 28-103: at San Juan.

***Senotainia rubriventris* Macquart**

Curran 28-103: at Caguas, Coamo Springs, Ensenada, Mayagüez and on Mona Id.

MUSCIDÆ

***Scenetes cardini* Malloch, J. R., "A New Genus and Species of Muscidae from Puerto Rico". Proc. Ent. Soc. Wash., Vol. 38, No. 1 pp. 9-10. Washington, D. C., January 1936: (TYPE from Cuba), others reared from guava, at Mayagüez, P. R. (A. G. Harley and K. N. Bartlett).**

***Graphomyia maculata* Scop.—det. J. M. Aldrich**

at Ponce (I No. 2826).

***Graphomyia stipata* Walker—det. J. M. Aldrich**

on mango blossoms at Mayagüez (I No. 3811).

***Cochliomyia americana* Cushing & Patton—det. E. C. Cushing**

Van Volkenberg 34-23: life-history and control notes.

at Mayagüez, April 13, 1935 (H. Van Volkenberg).

***Cochliomyia laniara* Wiedemann—det. J. M. Aldrich**

Curran 28-92: at Naguabo, Jayuya and on Mona Id.

at Mayagüez (I No. 2473).

Cochliomyia (Paralucilia Chrysomyia) macellaria Fabr.

(as *Chrysomyia*) Roeder. Gundlach. Coquillett. Van Z. (P. R. 1214).

Stevenson 18-150: host for fungus, *Cordyceps dipterygena* Berk. & Br.

EEP-154: an economic account.

(as "Screw-worm fly") Van Volkenberg: 32-25: notes.

Curran 28-92: at many localities in P. R. and on Mona Id.

AMC: at Las Marias xii-32, Joyuda iv-30. Hormigueros vi-32, Algarorbo x-30, etc.

on dung (20-17), on grapefruit tree at Vega Alta (116-17), on leaves of corn at Aguadilla (227-22), at Fajardo (394-21); attracted to gasoline (736-17).

Lucilia caesar Linn.

Coquillett.

Lucilia hirtiforceps Shannon

Curran 28-93: at Mayagüez and on Desecheo Id.

Lucilia pilatei Hough

Shannon, R. C., "Nearctic Calliphoridae, Luciliini". Insecutor Inscitiae Menstruus, Vol. 12, No. 4-6, pp. 67-81. Washington, D. C., April-June 1924: (p. 81) at Fajardo.

Lucilia rica Shannon

Curran 28-93: at Mayagüez, Naranjito, Arecibo.

Lucilia ruficornis Macquart

Roeder. Gundlach. Coquillett.

Lucilia semiviolacea Bigot, J., "Dipteres nouveaux ou peu connus".

In Annales Soc. Ent. France, No. 5, pt. 7, 1877, p. 46: TYPE from Porto Rico (as *Somomyia*).

Phenicia sp. (*Lucilia*)

AMC: at Mayagüez ix-30 and at Yabucoa vii-30 det. Curran.

Morellia (Pyrellia) ochricornis Wiedemann

Stahl. Roeder. Gundlach. Coquillett. Curran 28-91.

AMC: many records from all parts of the Island.

on dung (21-17), in citrus grove at Vega Alta (117-17);

larvae in wet decaying vegetation (436-17).

Morellia scapulata Bigot

(as *Pyrellia*) Wolcott 24-20, 23, 26, 31: eaten by *Anolis pulchellus*, *A. krugii*, *A. stratulus* and *A. cristatus*.

Curran 28-92: at many localities.

on corn leaves (254-21), on underside of coffee leaves (267-21); killed by *Entomophthora* sp. (near *E. calliphorae* Gird) det. V. K. Charles, at Caguas (I No. 5068); on mango blossoms at Mayagüez (I No. 3817); on eggplant at Manatí (I No. 615); resting on almendra leaf at Arecibo (I No. 1484);

on orange leaf at Pueblo Viejo (I No. 1911); on grapefruit at Arecibo (I No. 1966, 2143, 2433), at Naguabo (I No. 3936); (I No. 905, 2044, 2686); adults on jobo tree with ripe fruit (172-32 det. J. M. Aldrich).

Morellia violacea Fabr.

(as *Pyrellia centralis* Loew) Roeder. Gundlach.

(as *Pyrellia*) Wetmore 16ü84: eaten by Wood Pewee, *Blacus blacoi*.

Curran 28-92: at many localities.

in coffee grove at Ciales (GNW); in orange grove at Maricao (I No. 1256 Leonard 32-143). at Adjuntas (I No. 4081-C); at Mayagüez (I No. 2971).

Synthesiomyia nudiseta V. d. Wulp = **S. brasiliensis** B. & B.—det. J. M. Aldrich.

(430-12, 347-17.)

Musca domestica Linn.

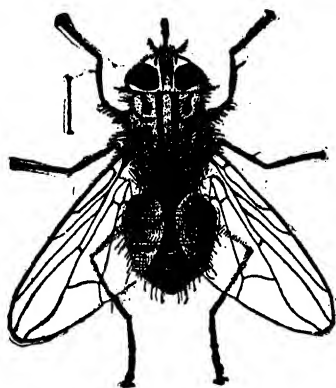
Stahl. Roeder. Gundlach. Coquillett. Van Z. (1717).

EEP-150 to 254: translation of Farmers' Bull. No. 851.

Curran 28-91: at many localities.

AMC: many records.

(151-11). larvae in rotten palm tree from Añasco (116-22); in rotten pumpkins at Arroyo (I No. 496); at Bayamón (I No. 2689), at Guayama (I No. 3967); very abundant in house near pile of fresh "cachaza" or filter press cake (GNW), at Hormigueros (GNW), at Santa Rita (EGS & GNW).



Musca domestica L. Six times natural size. (After Howard.)



Stomoxys calcitrans L. Six times natural size. (After Howard.)

Stomoxys calcitrans Linn.

Roeder. Gundlach. Coquillett. Van Z. (1727) on cattle.

Van Volkenberg 32-25: notes.

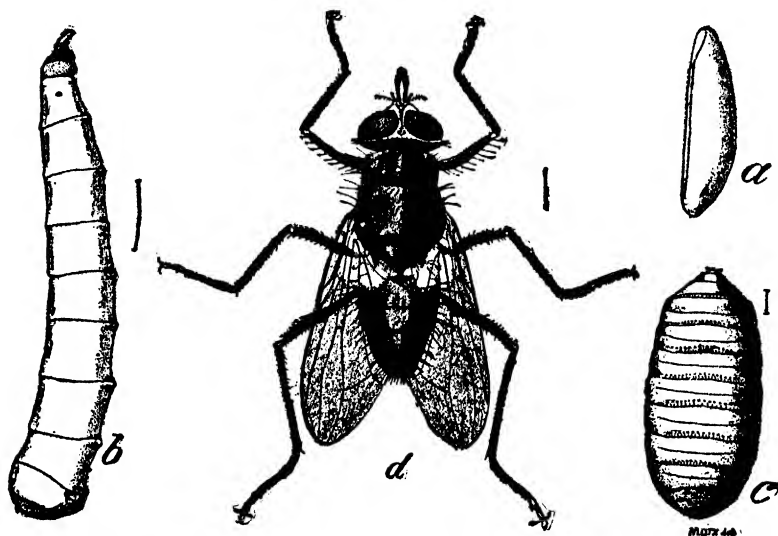
Van Volkenberg 34-24: on economic account.

AMC: many records.

Root 22-405: "feeding on cattle, horses and goats".

Curran 28-91: from Vieques Id.

(18-17, 23-17), at Bayamón (I No. 2695), at Luquillo (I No. 4919); resting on cabbage (I No. 3523).



Haematobia irritans L.: a, egg, b, larva, c, puparium, d, adult, ten times natural size. (After Howard.)

***Haematobia irritans* Linn.**

(as *Hyperosia*) Van Z. (1711) attacks cattle.

(as *H. serrata* Desv.) Merrill 15-53 to 55: life history and bionomics in P. R., parasites, predators and comensals of larvae.

(as *H. serrata* Rob. Desv.) Colón 19-34 and 35: summary.

(as *H. serrata*) Smyth, E. G., "La Mosca del Ganado (the Horn Fly)" Circ. 39, Insular Expt. Sta., pp. 1-17, pl. 4, February 1912: a compilation of remedies.

(as *H. serrata* Desv.) Wolcott 22d-18: a short account, comensals with and parasites of larvae in P. R.

EEP-163 to 165: on economic illustrated account.

Catoni, L. A., "Insectos que atacan a los Animales Domésticos". Rev. Agr. P. R., Vol. 10, No. 3, pp. 35-39. San Juan, 1923.

Dikmans, G., "Report of the Parasitologist". in P. R. (Mayagüez) Agr. Expt. Station Report for 1925, pp. 22-24.

Washington, D. C., 1927: abundance on south coast.

Van Volkenberg 32-25: notes.

Leonard 33-130: from Vieques Id.

Van Volkenberg 34-22: life history, importance, treatment and prevention.

AMC: many records.

Common on dry (southern) side of the Island, less abundant on the moist (northern) side. breeding in fresh cattle dung, adults attacking cattle.

Neomuscina tripunctata V. d. Wulp = **N. cavicola** Townsend
(as *Muscina*) Coquillett.

(Hypoderma lineatum De Villiers

EEP-162 to 163: not established in P. R.

Dikmans 27-24: found in imported cattle.

(as spp.) Van Volkenberg 32-25, 34-25 & 35-23: "introduced many times, but have not become established.")

ANTHOMYIIDÆ

Atherigona excisa Thomson = **A. orientalis** Shiner and **A. pulvinata** Grimshaw—det. J. M. Aldrich.

reared from decaying eggplant (129-16); reared from decaying oranges at Barceloneta (I No. 3292, 3293), at Mayagüez (I No. 280); in mandarin at Mayagüez (I No. 281); reared from kernels of corn (I No. 1207); in decaying string beans at Isabela (I No. 1223 Leonard 32-143); in decaying tomatoes at Aguadilla (I No. 1332), at Isabela (I No. 1768 Leonard 33-128); reared from roots of dasheen (I No. 2176 Leonard 33-114); resting on corn at Barceloneta (I No. 3295, 3296).

Ophyra aenescens Wiedemann

Roeder. Gundlach.

at Mayagüez (I No. 3918, 5156).

Endimnophora (Limnophora) arcuata Stein

(as *Limnophora*) Coquillett. Curran 28-91: at Naguabo, Mayagüez.

on weeds at Naguabo (I No. 4292); at Arecibo (I No. 4598); on *Muraya exotica* (I No. 3575).

Limnophora narona Walker—det. J. M. Aldrich

on melon leaves at Caguas (I No. 5059).

Limnophora spp.

Curran 28-91: many records of two species.

Myospila obsoleta Brauer & Bergenstamm

Curran 28-90: twenty specimens from Adjuntas, Arecibo and Jayuya.

Coenosia varicornis Coquillett oo-256: TYPE from P. R.

Coenosia flavipes Williston

Curran 28-89: reported from P. R. by Coquillett.

AMC: at Cidra ii-32 det. Curran.

Coenosia sp.

Curran 28-89: "the femora mostly and the tarsi wholly blackish."

Leucomelina corvina Giglio-Tos—det. J. M. Aldrich
on orange flowers at Adjuntas (I No. 4001-D); on grape-
fruit leaf at Barceloneta (I No. 4024); swept from weeds (25-
17—det as *Limnophora* J. M. Aldrich).

Leucomelina sp. nov.—det. J. M. Aldrich
on El Yunque (I No. 2098 Leonard 33-132).

Lispa rufitibialis Macquart
Coquillett: from Fajardo and on Culebra Id.
Curran 28-90: quoting Coquillett.

Philornis obscura Van der Wulp—det. C. T. Greene
at Ponce (I No. 5578).

Fannia femoralis Stein
Curran 28-89: at Mayagüez, Ensenada, Santurce.
AMC: at Mayagüez ix-30 det. Curran.

Fannia pusio Wiedemann—det. J. M. Aldrich
on *Murraya exotica* (I No. 3583).

Calythea crenata Bigot
Curran 28-89: at Mayagüez, Aibonito, Cayey.

Tetramerinx sp.
Curran 28-89: at San Juan.

Neodexiopsis rex Curran 28-88: TYPE from El Yunque, P. R.

Fucellia maritima Haliday
(as *F. fucorum* Fallen) Howard, L. O., Proc. Wash. Acad. Sci.,
Vol. 2, p. 599.

Bithoracochaeta despecta Walker
swept from grass at Corozal (GNW).

Bithoracochaeta leucoprocta Wiedemann
Curran 28-87: at Barros.

Bithoracochaeta varicornis Coquillett
Curran 28-88: at many localities.

SCATOPHAGIDÆ

Scatophaga exotica Wiedemann
Coquillett: from Culebra Id.

BORBORIDÆ

(the generic transfer from *Limosina* to *Leptocera* presumably
applies to all members of this family.)

Leptocera angulata Thomson
Curran 28-69: at many localities.
AMC: at Cidra ii-32 det. Curran, at Mayagüez det. Curran,
iii-32, ix-32, v-32, |v-32, Yauco ii-34, at Naranjito i-32 det.
Curran.

Leptocera discalis Malloch

Curran 28-69: at many localities.

Limosina fontinalis Fallen

Coquillett.

Limosina lugubrina Malloch, J. R., "Descriptions of New Species of American Flies of the Family Borboridæ" Proc. U. S. Nat. Mus., Vol. 44, No. 1958, pp. 361-372, Feb. 20, 1913, Washington, D. C.: TYPE from P. R.

Limosina lugubris Williston

Coquillett.

Limosina niveipennis Malloch 13-361: TYPE from P. R.

Limosina perparva Williston

Coquillett.

Leptocera pumila Williston

Curran 28-69: at Aibonito, Naguabo.

Limosina rotundipennis Malloch 13-361: TYPE from P. R.

Leptocera venalicia Osten Sacken

Coquillett (as *Limosina*).
at Mayagüez (1 No. 3915).

SCIOMYZIDÆ (TETANOCERIDÆ)

Sepedon caeruleus Mel.

AMC: at Cartagena Lagoon iii-27 det. J. M. Aldrich, iii-31, El Yunque iv-29, Barros iv-27, San Germán xii-32, and on many dates at Mayagüez.

Sepedon macropus Walker

Roeder. Gundlach. Curran 28-86: at Caguas, Cayey, Coamo. AMC: at Cartagena Lagoon iii-27 det. Curran, Río Piedras vi-32, v-32, Mayagüez vii-32.

SAPROMYZIDÆ

Lonchaea chalybea Wiedemann

Barrett 04-447: on *Manihot utilissima* and *M. palmata*.

Barrett 05-396: larva "a serious pest in the tips of cassava canes." Handpicking and tobacco dust in dry seasons as control.

EEP-107: "la Centella de la Yuca", an economic account.

González Ríos, Policarpo, "El Gusano del Cogollo de la Yuca".

Rev. Agr. P. R., Vol. 10, No. 4, pp. 45-46. San Juan, 1923.
larvae in terminal shoots of cassava at Manatí (157-13);
a common, and at times, a serious pest, reported by Agr.
Agents at Sabana Grande and Aguadilla.

Lonchaea glaberina Wiedemann

Van Z. (P. R. 1664) from pods of *Inga vera*.

Lonchaea longicornis Williston

Coquillett.

Lonchaea nigrocaerulea Malloch

Curran 28-85: at Tallaboa and Mayagüez.

Hoffman: at light, San Juan—det. Curran.

Lonchaea sp. nov.—det. J. M. Aldrich

at Mayagüez (I No. 3812, 4991, 2467).

Camptoprosopella diversa Curran 26-13: TYPE from Coamo

Springs, others from Arecibo, P. R. and Mona Id.

(as *Sapromyza cincla* Loew) Roeder. Gundlach.

Curran 28-82: no new data.

Curran 31-18: synonymy with *cincla* Loew.

Camptoprosopella sp.—det. J. M. Aldrich

in grapefruit grove at Añasco (I No. 4155).

Carpolonchaea pendula Bezzi—det. C. T. Greene

resting on cassava leaf at Arecibo (I No. 4859); reared from orange fruit (I No. 1022), at Mayagüez (I No. 1128, 1713, 2382, 2384, 2468); reared from fruit of *Inga laurina* at Jayuya (I No. 1962 Leonard 33-117); reared from lima beans at Isabela (I No. 2081-B).

Physogenua ferruginea Schiner

in coffee groves at Lares (391-21), at Ciales (GNW); on yautía leaf at Loíza (I No. 5193).

Physogenua vittata Macquart

(as *Lauxania variegata* Loew) Stahl. Roeder. Gundlach.

Curran 28-81: at many localities.

AMC: at Matrullas ii-43 det. Curran.

(I No. 912), in grapefruit grove at Palo Seco (I No. 548), at Mayagüez (I No. 4165).

Neogriphoneura sordida Wiedemann

(as *Sapromyza*) Coquillett.

Curran 28-82: at Adjuntas, Aibonito, Cayey and Mayagüez, P. R., and on Mona Id.

AMC: at Mayagüez x-30 det. Curran, and many other dates, Río Piedras v-32, vi-32, Hormigueros vi-32, Ponce 1-32.

Pseudogriphoneura albovittata Loew

(as *Lauxania*) Roeder. Gundlach.

Curran 28-83; at Mayagüez. Curran 31-19: at Cidra.

AMC: at Cidra ii-32 det. Curran.

(as *Sapromyza*) in grapefruit grove at Mayagüez (I No. 4164, 4903), at Arecibo (I No. 4948).

Pseudogriphoneura anomala Curran (as **Deceia**) 26-13: TYPE from Adjuntas, other from Naguabo, P. R.

Curran 28-83: generic transfer.

Curran 31-19: possible synonymy with *octopuncta* Wiedemann.

AMC: at Cidra ii-32 det. Curran.

Pseudogriphoneura sp. nov.—det. J. M. Aldrich

AMC: at Matrullas ii-32 det. as "sp." Curran.

resting on pomarrosa at Cidra (I No. 3581).

Pseudogriphoneura vittifacies Curran 31-20: TYPE from Aibonito, other from Adjuntas, P. R.

Caliope lutea Coquillett

Curran 28-83: from Arecibo, Aibonito.

AMC: at Cidra 11-32 det. Curran.

Caliope scutellata Curran 26-14: TYPE from Naguabo, P. R.

Curran 28-83: no new data.

Sapromyza octopunctata Wiedemann

Roeder. Gundlach.

Curran 31-19: possible synonymy with *Pseudogriphoneura anomala* Curran.

swept from grass at Morovis (GNW).

Sapromyza picticornis Coquillett—det. J. M. Aldrich

(as *Minettia*) Curran 31-20: at Dorado.

resting on grapefruit at Arecibo (I No. 1969 Leonard 33-132).

Minettia aibonito Curran 26-14: TYPE from Aibonito, many from other localities in P. R.

Curran 28-84: no new data.

Minettia mona Curran 26-13: TYPE from Mona Id., others from Naguabo and Aibonito, P. R.

Minettia macula Loew

IP-228: (as *Sapromyza valida* Walker = *S. macula* Loew—det. J. M. Aldrich (1042-16)).

on malojillo grass at Bayamón (I No. 2357); at Mayagüez (I No. 2466).

Minettia slossonae Coquillett

Curran 28-84: at Cayey, Mayagüez, Adjuntas, P. R., and on Mona Id.

Curran 31-21: at Cidra.

at Bayamón (I No. 2696), at Mayagüez (I No. 2471, 2970, 4166); in orange grove at Pueblo Viejo (I No. 1908 Leonard Leonard 33-132); in malojillo grass at Bayamón (I No. 2358).

Minettia sororia Williston

Curran 28-85: at Aibonito.

Trigonmetopus angustipennis Knab—det. J. M. Aldrich
(as "sp. nov."—det. J. M. Aldrich) IP-228: resting on coffee
leaf in the mountains north of Yauco (242-22).
on pomarrosa at Cidra (I No. 2622), in mountains north of
Yauco (I No. 2661).

Trigonmetopus vittatus Loew
AMC: at Matrullas ii-32 det. Curran.

ORTALIDÆ

Xanthacrona bipustulata van der Wulp
Curran 28-77: at Coamo Springs.

Macrostenomyia guerini Bigot
(as *Stenomacra*) Roeder. Gundlach.
Curran 31-17: at Cidra, Coamo Springs.
in orange grove at Ponce (I No. 3221 det. J. M. Aldrich),
at Maricao (I No. 3142).

Setellia amabilis Willinston
Curran 31-17: on El Yunque.

Epiplatea erosa Loew—det. J. M. Aldrich
at Mayagüez (I No. 3139).

Tetanops sp.
Wetmore 16-66: eaten by P. R. Tody, *Todus mexicanus*.

Ortalis quadrivittata Macquart
Stahl.

Acrosticta apicalis Williston
(as *Euxesta*) Coquillett.
resting on corn (257-21 det. J. M. Aldrich); at Añasco (I
No. 4271), at Arecibo (I No. 2394), on rotten graprefruit (I
No. 2881); in jobo tree with ripe fruit (173-32 det. J. M.
Aldrich).

Acrosticta foeveolata Loew
Curran 28-77: at many localities.

Euxesta abdominalis Loew
Curran 28-79: at many localities.

Euxesta annonae F.
Roeder. Gundlach. Van Z. (det. F. Knab).
Curran 28-79: at many P. R. localities and on Mona Id.
Curran 31-17: on Vieques Id.
AMC: at Mayagüez i-30 det. Curran.

Euxesta costalis F.
Roeder. Gundlach.

Euxesta mitis Curran 31-17, fig. of wing: TYPE from Vieques Id.

Euxesta eluta Loew

Curran 28-78: at many localities.

AMC: at Salinas iii-29 det. Curran, Yauco xii-33, Río Piedras v-32.

Euxesta notata Wiedemann

Faxon & Trotter 32-446: secondary in orange fruit.

Leonard 32-126: secondary in oranges.

AMC: at Coado vi-32.

from half rotten oranges at Mayagüez, (5-26), eggs laid in vial, larvae reared by F. Sein on pieces of orange, pupae in soil, adults 23 days after hatching of eggs or 26 days from egg to adult, other adults later observed in coconut grove at Loíza; (I No. 234, 1113, 1115, 1127, 909, 2508); from jobo fruit (I No. 1006, 1020), at Dorado (I No. 829), at Río Piedras (I No. 963-A); resting on tomato at Manatí (I No. 574).

Euxesta spoilata Loew

Roeder. Gundlach. Coquillett.

Curran 28-78: at many localities.

in orange grove at Mayagüez (I No. 4812).

Euxesta stigmatias Loew

Roeder. Gundlach. Coquillett.

Curran 28-78: at many localities.

AMC: at El Río xii-29 det. Curran, etc.

at Añasco (I No. 4272). at Mayagüez (I No. 2465), on banana leaf at Guayama (I No. 5047); reared from rotten corn (I No. 1210 Leonard 32-143).

Euxesta thomae Loew

Coquillett.

AMC: at Mayagüez v-29 det. J. M. Aldrich, and many other dates and localities.

Wolcott 21-42: common in cane fields, around cane ears and on human feces. Illustration of adult.

(as sp.) Wolcott 24-31; eaten by *Anolis pulchellus*.

adults on stems of *Agati grandiflora* at Añasco (1101-13) at Aibonito (SSC), at Manatí, Coloso, Guánica and Patillas (GNW); (I No. 906); from weeds at Naguabo (I No. 4291); resting on pepper leaf at Manatí (I No. 614), on watermelon leaf at Garrochales (I No. 635); at light at Comerío (I No. 3203); from wild oranges at Mayagüez (I No. 236, 3138), at Manatí (I No. 1019); attracted to ripe jobo fruits (169-32); larvae and pupae in *Xyleborus* tunnels in rotten coconut palm at Camuy (17-26).

Notogramma stigma F.

Curran 28-79: from Adjuntas and Ensenada, and on Mona and Desecheo Ids.

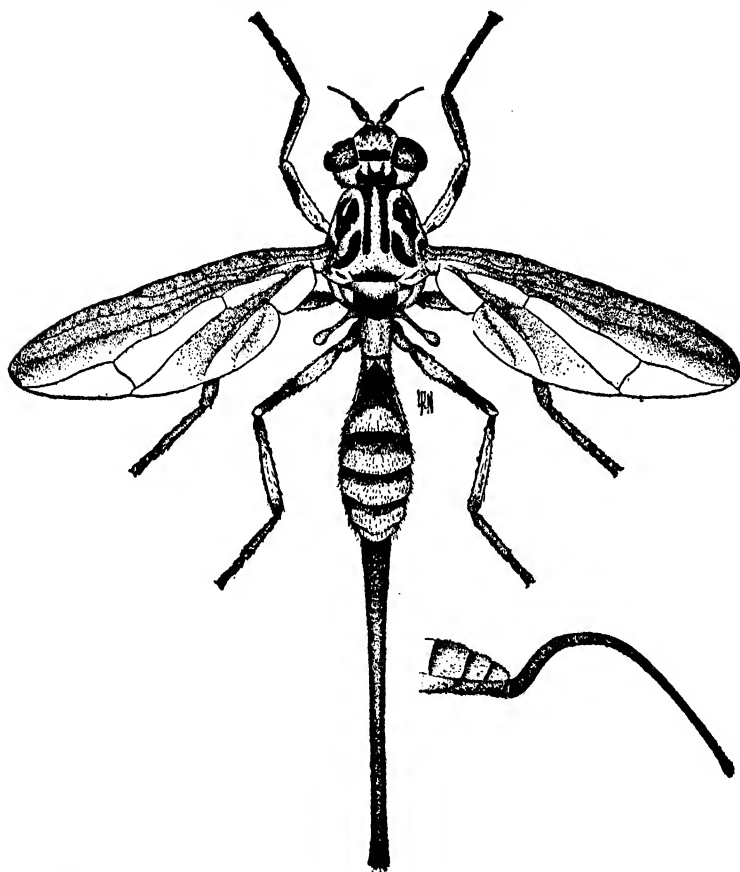
Cheatopsis fulvifrons Macquart

Curran 28-80: at San Juan.

AMC: at Mayagüez det. Curran.

Cheatopsis quadrifasciata Curran 28 80: TYPE from Barros, other from San Juan, P. R.

TRYPAMEIDÆ (TRYPETIDÆ)



Female of *Toxotrypana curvicauda* Gerstaecker. Five times natural size.
(Drawn by L. Pierre-Noël.)

Toxotrypana curvicauda Gerstaecker

Hooker 13-36: "Abundant at Mayagüez. —The eggs are laid well below the surface of the green fruit of papaya, (*Carica papaya*); 2 to 15 or more larvae within the fruit, and when it drops, pupate 1 or 2 inches below the surface of the ground below the fruit. Adults emerge in 17 to 21 days, and eggs for another brood are soon laid."

Van Z. (1243) in *Carica papaya*.

EEP-75: on papaya at Mayagüez.

Leonard, M D. & Seín., F., "The Papaya Fruit Fly in Puerto Rico." Jour. Ec. Ent., Vol. 24, No. 1, pp. 331-332. Geneva, N. Y., February 1931: recent collections at Lares and Mayagüez.

Faxon & Trotter 32-446: at Lares, Mayagüez and Ponce.

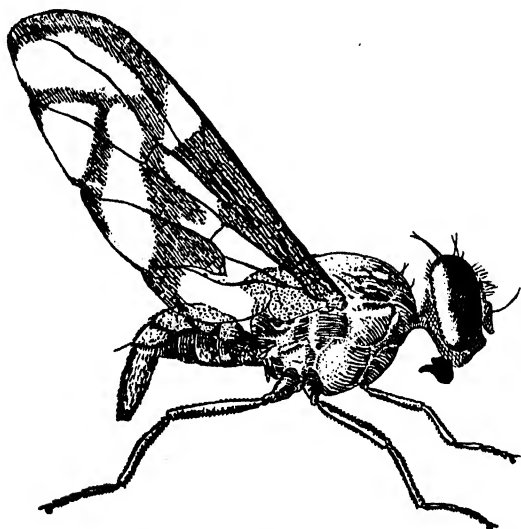
Leonard 32-134 & 33-120: distribution in P. R.

Wolcott 33-266: limited distribution in P. R.

EEWI-499: an extended economic account.

AMC: at Hormigueros 11-34, Mayagüez, 24.

reared from papaya at Lares (1-30, I No. 1197), at Mayagüez (I No. 1205, 1290, 1495), at Isabela (149-31), at Río Piedras on variety supposed to have come from Africa (A. S. Mills, L. C. McAllister & G. N. Wolcott).



Anastrepha fraterculus Wiedemann, var. *mombinpraeoptans* Seín. Eight times natural size.
(Drawn by F. Maximilien.)

Anastrepha acidusa Walker—det. C. T. Greene, or

Anastrepha fraterculus Wiedemann, var. *mombinpraeoptans* Seín, F., "Anastrepa (Trypetidae, Diptera) Fruit Flies in Puerto Rico." Jour. Dept. Agr. P. R., Vol. 17, No. 3, pp. 183-196, pl. 5, ref. 11. San Juan, November 14, 1933; TYPE of variety at Río Piedras, P. R., reared from fruit of *Spondias mombin* L.; others from "ciruela", *Spondias cirouella* Tussac and *S. purpurea* L., some mango varieties, *Mangifera indica* L., and rarely in "jobo de la India", *S. dulcis* Frost., occasionally in guava, "guayaba", *Psidium guajava* L., and rose apple,

- pomarrosa, *Jambos jambos* L. The egg is inserted in the fruit up to the shoulder, the head and neck protruding outside of the cuticle."
- (as *Acrotoxa fraterculus* Wiedemann) Roeder. Gundlach.
- Van Dine, D. L., "Mango Insects in Porto Rico." First Ann. Rpt. P. R. Hort. Soc. for 1912, pp. 20-22. San Juan, 1912.
- (as *Anastrepha acidusa* Walker) Tower 12-34 and 35: in fruit of imported mangoes, especially the Cambodiana variety. Life-history notes.
- (as *Anastrepha fraterculus* Wiedemann "closely related to *A. acidusa*"—det. M. Bezzi) Hooker 13-36; "in one of the native mangoes (mango de puerco)—in guava (*Psidium guajava*), jobo amarillo (*Spondias lutea*), and jobo de la India fruit. —The larvae in (the fruit of) jobo (*Spondias lutea*) are commonly attacked by two hymenopterous parasites, *Opius* (*Utetes*) *anastrephae* n. sp. (Viereck) and *Ganaspis* n. sp. (det. Crawford)."
- Van Z. (1202) in guayaba, mango, *Spondias lutea*.
- Kinman, C. F., "The Mango in Porto Rico." P. R. (Mayagüez) Agr. Expt. Sta. Bull. No. 24, pp. 30 pl. 11. Washington, D. C., 1918: recommends enclosing ripening fruits in paper bags for prevention of infestation.
- "Report of Hearing Held by the Federal Horticultural Board to Consider the Advisability of Restricting or Prohibiting the Entry from Porto Rico of Fruits and Vegetables into the United States." Jour. Dept. Agr. P. R., Vol. 8, No. 1, pp. 5-46, pl. 1. San Juan, August 1925: mostly concerning West Indian Fruit Fly. Notice of Quarantine No. 58, May 27, 1925.
- Dozier 26-119: report on the above hearing.
- López Domínguez 27-49: Sein's early experiments.
- Sein 29-93: a report on progress of investigations.
- Leonard 31-148 & 32-142: summaries of Sein's work.
- Faxon & Trotter 32-440 to 455: an account of quarantine and survey.
- EEWI-505: intensive studies in P. R. due to quarantine restrictions.
- Wolcott 34-100: an extended summary of Sein's investigations.
- Greene, C. T., "A Revision of the genus *Anastrepha* based on a Study of the Wings and on the Length of the Ovipositor Sheath (Diptera: Trypetidae)." Proc. Ent. Soc. Wash., Vol. 36, No. 6, pp. 127-179, pl. 5, ref. 36. Washington, D. C., July 9, 1934: described from Jamaica, specimens in U. S. National Museum from Panama, Canal Zone, Costa Rica, Jamaica, Haiti, Dominican Republic, at Río Piedras, Loíza, Bayamón, Santurce, Mayagüez, Aibonito and Ponce, P. R., St. Kitts, Nevis, Dominica, Martinique and St. Lucia of the Lesser Antilles, and in the U. S. at Key West, Florida and Weslaco, Texas. "This species appears to be the common form in the West Indies.

Reared from the following fruits: plum (*Spondius mombin* and *S. lutea*), rose apple or pomarosa (*Eugenia jambos*), mango (*Mangifera indica*) and guava (*Psidium guajava*). I am convinced that it is a distinct species."

Seín, F. "Heat Sterilization of Mangoes and Guavas for Fruit Flies." Jour. Agri. Univ. P. R., Vol. 19, No. 2, pp. 102-112. ref. 3. San Juan, September, 1935: sterilization for eight hours, or four hours at 43° C. kills eggs, larvae and pupae in mangoes.

adults resting on grapefruit (555-17), on corn leaf (253-21), on coffee leaf (264-21): larvae from fruit of guava, *Psidium guajava*, at Ciales (893-13); from fruit of jobo, *Spondias lutea*, (67-16), from mango, *Mangifera indica*, (305-12); early determinations by C. T. Greene as *A. fraterculus*, seven interceptions reared from fruit of guava at Mayagüez, Bayamón, Palo Seco and Río Piedras: thirteen reared from fruit of jobo at Mayagüez, Rincón, Ponce, Bayamón and Río Piedras: four from fruit of mango at Mayagüez, San Germán and Río Piedras: later determinations by C. T. Greene as *A. acidusa* Walker, reared from mango (I No. 2603), from jobo No. 962-A), from guava at Ponce (I No. 1235, 1248), many others of adults collected in citrus groves but not reared from fruit.

Anasterpha suspensa Loew or

Anastrepha unipuncta Seín 33-190 to 191: TYPE from Río Piedras, P. R., reared from *Psidium guajava*, others from pomarrosa, almendra kunquat, caimito, nispero and corazón; sporadically, in the spring and early summer in grapefruit, sour orange, native and Valencia orange, "differentiated from *mombinpraeoptans* by the dark spot on the suture between the mesothorax (mesonotum) and the scutellum (not mentioned by Loew in his description of *suspensa*). The egg has no neck and is deposited entirely underneath the cuticle of the fruit."

(as *A. fraterculus*) Van Zwaluwenburg 18-34: a heavy infestation—near Maricao in July (1917) in pomarosa fruits *Eugenia jambos*."

Greene 34-132 (Puerto Rico, Cuba, Florida) and 147 to 148: TYPE from Cuba, specimens in U. S. National Museum from Cuba and from Arecibo, Bayamón, Villalba and Fajardo, P. R., reared from hosts given by Seín.

Seín 35-102-112: sterilization for eight hours, or four hours, at 43° C. kills eggs, larvae and pupae in guavas.

determinations by C. T. Greene as *A. suspensa* Loew: larvae in sour orange at Mayagüez (I No. 1439), in grapefruit at Mayagüez (I No. 1423, 1431, 1440), in guava at Mayagüez (I No. 3283), at Barceloneta (I No. 4103), in almendra at Mayagüez (I No. 3509), besides many as "sp." or "near *fraterculus*" adults in citrus groves, or reared from the hosts given by Seín and Greene.

Polymorphomyia bascilica Snow—det. J. M. Aldrich

Curran 31-15: at Naguabo.

AMC: at Aibonito vi-30 det. Curran.

from elongate gall on stem of *Eupatorium odoratum* (39-17); at Adjuntas (I No. 5574).

Aciura insecta Loew

Roeder. Gundlach.

Wolcott 21-42: adults resting on cane leaves at Coloso, Aguada, Camuy, Arecibo, Manatí and in "hills of north and west coast" of the Island.

Curran 28-71: at many localities.

Curran 31-15: at Isabela.

AMC: at Hornigueros v-32, Mayagüez x-34.

resting on corn leaves (502-17), at Aguadilla (226-22): (as *Xanthaciura*) resting on *Crotalaria* at Naguabo (I No. 2440).

Xanthaciura phoenicura Loew—det. J. M. Aldrich

(I No. 917), on grass at Añaseo (I No. 1220 Leonard 32-143).

Ensina humilis Loew

Roeder. Gundlach.

Wolcott 21-42: adults resting on cane at San Sebastián, Manatí, Corozal and other localities in "hills of north and west coast" of the Island.

Wolcott 24-30: eaten by *Anolis pulchellus*.

in grapefruit grove at Mayagüez (I No. 4167).

Ensina perigrina Loew

Coquillett.

Ensina piciccola Bigot

Curran 28-70: at many localities.

at Cidra (I No. 2625 as *E. chilensis* McG.); resting on sour orange at Mayagüez (I No. 4237).

Acrotaenia testudinea Loew—det. C. T. Greene

at Orocovis (I No. 5583), on orange tree at Trujillo Alto (I No. 495); resting on almendra leaf at Arecibo (I No. 1466), at Rincón (I No. 4005), on flamboyán leaf at Bayamón (I No. 5121).

Trypanea daphnae Wiedemann—det. J. M. Aldrich

AMC: at Boquerón iii-29, Mayagüez iv-29.

Trypanea daceptoptera Phillips—det. C. T. Curran

AMC: at Boquerón iii-29.

Trypanea mevarna Walker

(as *Urellia solaris* Loew—det. J. M. Aldrich) IP-230: common on malojillo grass at Pt. Cangrejos and on cane at San Sebastián (GNW).

Curran 28-71: synonymy; at Adjuntas.

Dyseuaresta melangoster Loew

(as *Euaresta*) Roeder. Gundlach. Curran 28-73: common.
Curran 31-15: generic transfer.

resting on grapefruit at Vega Alta (231-17); swept from
grass in coffee grove at Ciales (68-21), at Caguas (GNW),
in orange grove at Maricao (I No. 1259 Leonard 32-142).

Euaresta mexicana Wiedemann

Van Z. (P. R. 106).

Curran 31-15: "not seen".

Dyseuaresta plesia Curran (as **Euaresta**) 28-71. fig, of wing: TYPE
from Coamo Springs, P. R.

Curran 31-15: generic transfer.

Tetreuaresta obscuriventris Loew

(as *Euaresta*) Curran 28-73); from Adjuntas, Barros, Arecibo,
Mayagüez, Naguabo.

Curran 31-15: generic transfer.

AMC: at Cidra ii-32 det. Curran, at Maricao iii-29 det. Curran,
iv-31, Las Marías, i-31.

Plagiotoma pura Curran 31-16: TYPE from Jájome Alto, P. R.

BLEPHARONEURIDÆ

Blepharoneura fulvicollis Van der Wulp—det. C. T. Greene
at Ponce (I No. 5572).

MICROPEZIDÆ

Nerius cinereus Roeder 85-348: TYPE from P. R.

Curran 31-21: not seen.

Micropeza limbata Roeder 85-347: TYPE from P. R.

Gundlach. Curran 28-25: at Adjuntas, Mayagüez.

Curran 31-21: at Cidra, Maricao.

AMC: at Las Marías iv-29 det. Curran; at Río Piedras vi-32.
on flowers of orange at Adjuntas (I No. 4001).

Systellapha scurra Enderlein

(as *Calobata* sp.) IP-230: described; at Vega Alta (105-17);
in coffee groves in mountains at Ciales (461-21), at Utuad,
(479-21), at Adjuntas (90-22). Wolcott 24-31: eaten by
Anolis cristatellus.

Curran 28-85: at Mayagüez, Adjuntas, Cayey, Naranjito.

Curran 31-21: "arista plumose"; on El Yunque.

AMC: at Coamo Springs vi-30 det. Curran, Ponce xii-33,
Yauco ii-30, Añasco x-30, Maricao xii-33, Barranquitas
xii-30, Barros iv-27, Lares vii- , Luquillo v-31, and on
many dates at Mayagüez.

on El Yunque (I No. 2210); on orange flowers at Adjun-
tas (I No. 4001-B), at Mayagüez (I No. 4238).

Hoplocheiloma fasciata F.

(as *Taeniptera*) Stahl.

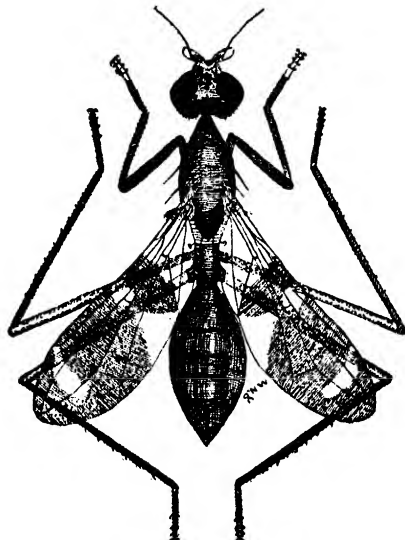
(as *Calobata*) Roeder. Gundlach, "común". Coquillett, (on human excrement, Howard). IP-230.

Curran 28-85: at Fajardo.

AMC: at Mayagüez iv-30 det. Curran, x-32.

Calobata munda Van der Wulp—det. C. T. Greene

resting on grapefruit leaf at Añasco (I No. 2292).



Grallopoda lasciva F. Six times natural size. (Drawn by G. N. Wolcott.)

Grallopoda (Calobata) lasciva F.

(as *Taeniptera*) Stahl.

(as *Calobata*) Roeder. Gundlach. Coquillett.

(as *Calobata*) Wolcott 21-41: "common in cane fields—reared from old cane stalks." Illustration of adult.

(as *Calobata*) Wolcott 24-31: eaten by *Anolis cristatellus*.

(as *Taeniptera*) Curran 28-85: at many localities.

(as *Taeniptera*) Curran 31-21: at Río Piedras.

Cresson, E. T., Jr., "Notes and Descriptions of some Neotropical Neriidae and Micropezidae." Trans. Amer. Ent. Soc., Vol. 56, No. , p. 350. Columbus, O., 1930: records from P. R.

AMC: at Mayagüez vi-28 det. J. M. Aldrich, also on many other dates and at many other localities.

(I No. 922, 1509); on pepper leaf at Bayamón (I No. 612); on corn at Juana Díaz (I No. 3223); on sweet potato leaf at Arecibo (I No. 2493); on tomato leaf at Manatí (I No.

573); on eggplant at Bayamón (I No. 589); adults on cane leaves at Arecibo (187-11), at Manatí (65-15), at Toa Alta (452-21), at San Sebastián, Guayanilla (GNW); reared from larvae in decaying cane cuttings (124-12) and in dry cane stalk (2-21).

CLUSIIDÆ

Sobarocephala bivittata Melander & Argo
Curran 31-22: at Dorado (W. A. Hoffman).

SEPSIDÆ

Sepsis armata Schiner
Curran 28-75: at Adjuntas, Aibonito, Mayagüez.

Sepsis armillata Melander & Spuler
Curran 28-76: at many localities.

Sepsis discolor Bigot
Roeder. Gundlach. "muy rara."

Sepsis furcata Melander & Spuler
Curran 28-75: at Mayagüez and Arecibo.

Sepsis haemorrhoidalis Schiner
Curran 28-74: at many localities.
AMC: at Matrullas ii-32 det. Curran, Río Piedras i-32 det. Curran.

Sepsis pusio Schiner
(as *Sepsis insularis* Williston) Coquillett.
Curran 28-76: at many localities in P. R., and on Mona Id.

Sepsis simplex Curran 28-75: TYPE from Adjuntas, others at Naguabo (around horse manure), Arecibo, P. R.
on corn at Barceloneta (I No. 3211 det. as *insularis*).

Ephydra sp.—det. J. M. Aldrich
AMC: at Ensenada xi-26.

Ephydra sp. nov.—det. C. H. Curran
AMC: at Ensenada xi-26, Faro de Cabo Rojo i-31.

EPHYDRIDÆ

Notiphila erythroceræ Loew
Roeder. Gundlach.

Notiphila furcata Coquillett
Curran 28-59: at San Juan and Ensenada.

Notiphila virgata Coquillett 00-259: TYPE from P. R.
Curran 28-59: at La Tortiguera, Corozal, Naguabo, San Juan.

Discomyza dubia Williston
Curran 28-62: at Manatí.

Discomyza maculipennis Wiedemann—det. J. M. Aldrich
resting on *Murraya exotica*, hedge around Federal Building,
San Juan (I No. 3357); on SS. "Catherine" in San Juan
harbor (I No. 2377).

Paralimna ciliata Cresson
Curran 28-60: at San Juan, Coamo Springs, Aibonito.

Paralimna decipens Loew
Coquillett.

Paralimna obscura Williston
Coquillett.

Paralimna plumbiceps Cresson
Curran 28-60: at Adjuntas, Coamo Springs.

Ptilomyia enigma Coquillett 00-261: TYPE from P. R.

Hydrellia calverti Cresson
Curran 28-60: at Arecibo, Adjuntas, Aibonito, Naguabo.

Allotrichoma abdominalis Williston
Coquillett.

Psilopa aciculata Loew
Coquillett. (as *Plagiops*) Curran 28-62: at many localities.

Psilopa mellipes Coquillett 00-260: TYPE from P. R.

Psilopa skinneri Cresson
Curran 28-60: at many localities.

Psilopa unica Cresson
Curran 28-60: at Adjuntas, Mayagüez.

Plythea flavipes Williston
Coquillett.

Plythea fenestralis Cresson
Curran 28-60: at Aibonito.

Plythea ? oscitans Walker (*Ephydra*)
Coquillett.

Athyroglossa nitida Williston
Coquillett.
at Naguabo (I No. 3938).

Discocerina leucoprocta Loew
Coquillett. Curran 28-62: subsp. *incisa* Coquillett, at San
Juan, Coamo, Manatí, Mayagüez.

Discocerina obscura Williston
Curran 28-63: at Naguabo, Cayey, Mayagüez.

Discocerina obscurella Faller

(as *D. parva* Loew) Coquillett.

Curran 28-63: at Mayagüez and on Mona Id.

Hydrellina gilvipes Coquillett 00-261: TYPE from P. R.

Ceropsilopa adjuncta Cresson, E. T. Jr., "Descriptions of New Genera and Species of the Dipterous Family Ephydriidae. VII". Ent. News, Vol. 36. No. 6, p. 165. Philadelphia, June 1925: TYPE from Adjuntas, others from Manatí, Arecibo, Naguabo, P. R.

Curran 28-61: no new data.

Ceropsilopa coquilletti Cresson

Curran 28-61: from Mona Id.

Ceropsilopa mellipes Coquillett

Curran 28-61: at Adjuntas, Arecibo, Naguabo.

Typopsilopa flavitarsis Cresson

Curran 28-61: at Mayagüez, Arecibo.

Leptopsilopa willistoni Cresson

(as *Psilopa nigrimana* Williston) Coquillett.

Curran 28-61: at many P. R. localities and on Descueho Id. at Bayamón (1 No. 3970 det. as *nigrimana*).

Plagiops aciculata Loew

Curran 28-62: at many P. R. localities and on Mona Id.

Ochtheroidea centralis Cresson

Curran 28-63: at Mayagüez, San Juan.

Ochtheroidea laevis Cresson

Curran 28-63: at many localities.

AMC: at Mayagüez xii-30 det. Curran.

CHLOROPIDÆ (OSCINIDÆ)

Chloropisca atra Curran 26-3: TYPE from Arecibo, P. R.

Curran 28-44: mention.

Prohippelates pallidus Loew

Curran 28-45: from Mona Id.

Chlorops trivittata Williston

Coquillett.

Hippelates apicata Malloch, J. R., "The Genera of Flies of the Subfamily Botanodinae with hind tibial spur". Proc. U. S. Nat. Mus. Vol. 46, No. 2024, pp. 242-255. Dec. 6, 1913, Washington, D. C., TYPE from Porto Rico, p. 248.

Curran 28-50: from Mona Id.

Hippelates bicolor Coquillett

Curran 28-49: at Manatí and from Mona Id.

Hippelates convexus Loew

Coquillett. Malloch 13-249.

Curran 28-48: at many P. R. localities and from Mona Id.

Hippelates collusor Curran 26-5: (TYPE from St. Thomas), others from Manatí P. R. and Mona Id.

Curran 28-49: no new data.

Hippelates dorsatus Williston

Curran 28-46: from Mona Id.

Hippelates flavipes Loew

Coquillett. Van Z. (1712).

Curran 28-49: at Arecibo, Barros, San Juan and from Mona Id.

Curran 31-11: from Vieques Id.

(1054-16); resting on leaves of *Chalcas (Murraya) exotica* (1 No. 3300).

Hippelates ilicis Curran 26-4: TYPE from Arecibo, others from Manatí, P. R.

Curran 28-48: no new data.

Hippelates incipiens Curran 26-6: TYPE from Naguabo, other from Coamo Springs, P. R.

Curran 28-47: no new data.

Hippelates impressus Becker

Curran 28-47: from Desecheo Id.

Hippelates lutzi Curran 26-5: TYPE from Mona Id.

Curran 28-49: mention.

Hippelates nigricoxa Malloch

Curran 28-48: at many localities.

Hippelates nobilis Loew

Curran 28-48: at Adjuntas, Aibonito, Arecibo.

Hippelates nudifrons Malloch 13-242: TYPE from P. R. and Vieques Id.

Curran 28-48: mention.

Hippelates pusio Loew

Coquillett. Curran 28-49: from Arecibo, Adjuntas, Ensenada P. R., and Mona Id.

on cattle at Mayagüez (Bishopp No. 18780) H. L. Van Volkenberg.

Hippelates partitus Becker

Curran 28-48: at Aibonito. Curran 31-11: on Vieques Id.

Hippelates pallipes—det. J. M. Aldrich

on cattle at Mayagüez (Bishopp No. 18780) H. L. Van Volkenberg.

Hippelates peruanus Becker

Malloch 13-244. Curran 28-49: from Aibonito, Jayuya, Adjuntas, San Juan. Curran 31-11: on Vieques Id.

Hippelates scutellaris Williston

Curran 28-47: from Adjuntas.

Hippelates tener Coquillett

Malloch 13-255. Curran 28-47: at Arecibo and on Mona Id.

Hippelates texanus Malloch—det. J. M. Aldrich

Wolcott 21-42: “ ‘Mimis’—abundant on cane at Guánica—often in great abundance in cane fields at many other places in the dryer parts of Porto Rico.”

EEP-170: economic notes.

Van Volkenberg 32-25: notes.

Annoying to man and animals, buzzing about and resting on ears, nose, mouth and eyes.

Pseudogaurax sp. nov.—det. J. M. Aldrich

at Bayamón (I No. 5135-B).

Pseudogaurax lancifer Coquillett, 00-265. TYPE from Porto Rico: reared from egg-sacs of spiders.

from eggs of spider, *Gasteracanthia canceriformis* Linn. (333-21) and at Pt. Cangrejos (GNW); resting in guava leaf at Barceloneta (I No. 4021).

Elachiptera flava Williston

Curran 28-50: at Cayey.

Madiza mattea Curran 26-5: TYPE from Adjuntas, P. R.

Curran 28-50: no new data.

Madiza quinquilineata Adams

Curran 28-50: at Manatí, Coamo Springs.

Siphunculina signata Williston—det. J. M. Aldrich

(I No. 2124 Leonard 33-132).

Oscinella forbesi Curran 31-12: TYPE from Vieques Id., others from Adjuntas, Aibonito, Arecibo, Corozal, Manatí, Naguabo, P. R.; generic transfer of *Oscinis* and *Botanobia* to *Oscinella*; *coxendix* Fitch does not occur in P. R.

(as *Oscinis coxendix* Fitch) Coquillett.

AMC: at Mayagüez xi-30 det. Curran.

on corn at Loíza (I No. 2189), on eggplant at Loíza (I No. 2035).

Oscinella anonyma Williston

(as *Oscinis*) Coquillett.

(as *Botanobia*) Curran 28-51: at many localities.

- Oscinella anonyma pura** Curran 26-7 (as **Botanobia**): TYPE from San Juan, P. R.
(as *Botanobia*) Curran 28-51: fig. of wing and head.
- Oscinella confusa** Malloch
(as *Botanobia*) Curran 28-55: at Cayey, Mayagüez.
- Oscinella diversipes** Curran 26-7 (as **Botanobia**): TYPE from Arecibo, P. R.
(as *Botanobia*) Curran 28-51: fig. of head.
- Oscinella limitata** Becker
(as *Botanobia*) Curran 28-53: at many P. R. localities, and on Mona Id.
- Oscinella lutzi** Curran 26-6 (as **Botanobia**): TYPE from Arecibo, others from Adjuntas, P. R.
(as *Botanobia*) Curran 28-51: fig. of head.
- Oscinella mars** Curran 26-10 (as **Botanobia**): TYPE from Naguabo, P. R., others from Mona Id.
(as *Botanobia*) Curran 28-56: fig. of wing and head.
- Oscinella mona** Curran 26-9 (as **Botanobia**): TYPE from Mona Id.
(as *Botanobia*) Curran 28-56: fig. of head and wing.
- Oscinella magnipalpoides** Curran 26-11 (as **Botanobia**): TYPE from Arecibo, others from San Juan, P. R.
(as *Botanobia*) Curran 28-56: fig. of head and wing.
- Oscinella nana** Williston
(as *Oscinis*) Coquillett.
- Oscinella obscura** Coquillett (as **Oscinis**) 00-266: TYPE from P. R.
(as *Botanobia*) Curran 28-56: at Mayagüez, Manatí, Naguabo, San Juan.
- Oscinella palliata** Curran 28-8 (as **Botanobia**): TYPE from Adjuntas, P. R.
(as *Botanobia*) Curran 28-55: fig. of wing and head.
- Oscinella plesia** Curran 26-11 (as **Botanobia**): TYPE from Arecibo, P. R.
(as *Botanobia*) Curran 28-56: no new data.
- Oscinella quadrilineata** Williston
(as *Oscinis*) Coquillett.
- Oscinella sicatrix** Curran 26-8 (as **Botanobia**): TYPE from Mona Id.
(as *Botanobia*) Curran 28-56: fig. of head and wing.
- Oscinella tripunctata** Curran 26-10 (as **Botanobia**): TYPE from Mona Id.
(as *Botanobia*) Curran 28-56: fig. of head and wing.
- Oscinella umbrosa** Loew
(as *Oscinis*) Coquillett.

Oscinella varipalpus Curran 26-12 (as **Botanobia**): TYPE from Mona Id., another from San Juan, P. R.
(as *Botanobia*) Curran 28-58: fig. of wing and head.

Oscinella virgata Coquillett
(as *Oscinis*) Coquillett.

ASTEIIDÆ

Sigaloessa bicolor Loew
Coquillett.
resting on banana at Bayamón (I No. 2194 Leonard
33-137).

Sigaloessa insularis Curran 31-13: TYPE from Vieques Id.

DROSOPHILIDÆ

Drosophila ampelophila Loew—det. C. T. Greene
adult resting on banana at Maricao (I No. 1254 Leonard
32-143), resting on squash (I No. 3525); reared from jobo
fruit (I No. 1007), from string bean pods (I No. 1224),
from guava at Arecibo (I No. 1871).

Drosophila funebris F.
Coquillett.

Drosophila fusca Coquillett 00-264: TYPE from P. R.

Drosophila lutzi Sturtevant
Curran 28-64: from El Yunque.

Drosophila melanogaster Meigen
Van Z. (P. R. 110).
AMC: at Mayagüez x-30, xi-30, ix-30, Coamo ix-32, viii-32,
vi-32.
in decaying oranges (599-16).

Drosophila punctata Loew—det. C. T. Greene
reared from jobo fruit (I No. 1007).

Drosophila repleta Wollaston
Curran 28-64: at Santurce.
AMC: at Mayagüez xi-30, xii-30 det. Curran, Río Piedras
v-32, Coamo vii-32, ix-32.
(I No. 2124-B Leonard 33-137); in grapefruit grove at
Añasco (I No. 4159).

Drosophila similis Williston
AMC: at Mayagüez xi-30 det. Curran.

Drosophila sp.—det. J. M. Aldrich
from ovary of flower of "tibey", *Isotoma longiflora*,
(490-21).

Scaptomyza vittata Coquillett

(as *Drosophila*) Coquillett.

resting on squash at Vega Baja (I No. 3596).

Stenomicroa angustata Coquillett 00-262: TYPE from P. R.

Cladochaeta nebulosa Coquillett 00-263: TYPE from P. R.

Lucophenga frontalis Williston

AMC: at Coamo Springs iv-31 det. Curran, Mayagüez
viii-32, Río Piedras v-32.

Leucophenga sp. nov. (near *bimaculata* L.)—det. J. M. Aldrich
on flamboyant at Bayamón (I No. 5135).

GEOMYZIDÆ

Anthomyza nigrimanus Coquillett

Tethina sp. nov.—det. J. M. Aldrich
(I No. 3042).

AGROMYZIDÆ

Agromyza aeneiventris Fallen
Coquillett.

"probably *caerulea*" Aldrich.

Agromyza caerulea Malloch—det. J. M. Aldrich
from stem of *Eupatorium odoratum* (341-16); from morn-
ing glory seeds (141-17); from *Bidens pilosa* flower heads
at Guayama (I No. 5019).

Agromyza ipomeae Frost, S. W., "New Species of West Indian Agro-
myzidae (Diptera)". Ent. News, Vol. 43, No. 3, pp. 74-76.
Philadelphia, March 1931; TYPE from P. R., a leaf-miner
in leaves of sweet-potatoes.

Leonard 31-119: of minor importance.

Leonard 32-137 & 33-123: in all fields examined.

Agromyza inaequalis Malloch, J. R., Proc. Wash. Ent. Soc., Vol.
XVI, No. 2, pp. 89-90, fig. 1. June, 1914: from leaves of
Vigna repens (983-13 TYPE & 1137-16).

EEP-109: a minor pest of beans.

Leonard 32-124: on cabbage.

from leaves of lima beans (722-17 det. R. T. Cotton, I
No. 1840).

Agromyza insularis Malloch—det. J. M. Aldrich
from seed pods of Chinese mustard (699-17).

Agromyza jucunda V. d. Wulp—det. J. R. Malloch
Coquillett.

from leaves of *Eupatorium odoratum* (1204-13, 1139-16),
of wild morning glory at Vega Alta (I No. 3298): adults

resting on *Chalcas (Murraya) exotica* (I No. 3299), on gandul at Guayama (I No. 4253), in grapefruit grove at Mayagüez (I No. 4236).

Agromyza maculosa Malloch—det. J. M. Aldrich

Curran 28-65; at many localities.

AMC: at Mayagüez vi-30 det Curran.

Frost 31-76: the following record.

from leaves of aster (211-22).

Agromyza melampyga Loew

Curran 28-65: at Naguabo, Arecibo.

Agromyza minima Malloch, J. R., "Revision of Specie of *Agromyza*". Ann. Ent. Soc. Amer., Vol. VI, No. 3, p. 328. TYPE from P. R.

Agromyza neptis Loew

Coquillett.

Agromyza parvicornis Loew—det. W. R. Walton

EEP-43: a leaf-miner in corn. Curran 28-66: at Adjuntas.

EEWI-248: a minor pest of corn.

Frost 31-36: the following record.

from leaves of corn (719-12).

Agromyza platyptera Thomson

Curran 28-65: at many localities.

Agromyza plumiseta Malloch, J. R., Ann. Ent. Soc. Amer., Vol. VI, No. 3, 324. TYPE from Porto Rico.

Agromyza pusilla Meigen

(as *A. diminuta* Walker) Coquillett.

larvae mining in pea leaf at Cidra (I No. 2006 Leonard 33-121), in cohitre leaf at Humacao (I No. 3301), reared from flower heads of *Bidens pilosa* at Guayama (I No. 5046); adults resting on potato leaf at Carolina (I No. 3491).

Agromyza setosa Loew

Coquillett.

Agromyza viridula Coquillett, D. W., "New Acalyptrate Diptera from North America." Jour. N. Y. Ent. Soc., Vol. X, pp. 190, Dec. 1902. TYPE from Porto Rico.

Curran 28-66: at many localities.

at Loíza (I No. 3782), in weeds at Cidra (I No. 4285); on gandul leaf at Guayama (I No. 4252); in grapefruit grove at Añasco (I No. 4267); on cucumber at Caguas (I No. 4865).

Agromyza virens Loew—det. J. M. Aldrich

Curran 28-65: at many localities.

at Mayagüez (I No: 3910, 3911, 4552).

Agromyza xanthoptera Schimer—det. J. M. Aldrich
in orange grove at Mayagüez (I No. 4906).

(**Cryptochaetum iceryae** Williston—introduced, not established
Wolecott & Sein 33-216: unsuccessful attempt at introduction due
to scarcity of the host, *Icerya purchasi* Maskell, immediately
after the hurricane of San Ciprián.

the above sending (155-32); another sending by air-mail,
sent from Riverside, California October 31, 1933, received in
good condition at Río Piedras on November 7, 1933, adults
released as they emerged in the Condado; no recoveries to
date from scale collected weekly or oftener in this locality.)

Cerodonta dorsalis Loew

Coquillett. EEP-43: a leaf-minor in corn.

EEWI-248: a very minor pest on corn.

from mine in corn leaf (513-17).

OCHTHIPHILIDÆ

Leucopsis bella Loew

Coquillett: from larvae feeding on *Dactylopius citri*.

IP-234: from *Pulvinaria psidii* Maskell on jobo at Arroyo
(173-12).

Curran 31-13: on Vieques Id. "The larvae are predaceous,
feeding on aphids and mealybugs ---"

Acrometopia maculata Coquillett

Curran 28-66: from Mona Id.

MILICHIIDÆ

Eccoptomma montanum Becker

Curran 28-66: at Mayagüez; re-description.

Milichiella arcuata Loew

Curran 28-68: on Desecheo Id.

Milichiella cinerea Coquillett

(as *Ophthalmomyia*) Coquillett 00-268: TYPE from P. R.

Curran 28-68: generic transfer.

Milichiella lacteipennis Loew

(as *Ophthalmomyia*) Coquillett.

also, not in synonymy, (as *Desmometopa halteralis*) Coquillett
00-267: TYPE from P. R.

Curran 28-67: synonymy, at San Juan, Adjuntas, Manatí, Ma-
yagüez, Guayanilla, and on Mona and Desecheo Ids.

Curran 31-14: in Vieques Id.

resting in eggplant at Loíza (I No. 2034), on *Chalcas* (*Mur-
raya*) *exotica* (I No. 3305).

Desmometopa M-nigrum Zetterstedt

Curran 28-68: at Jayuya.

on *Chalcas* (*Murraya*) *exotica* (I No. 3437); on grapefruit
blossoms at Mayagüez (I No. 2388), on grapefruit leaf at
Arecibo (I No. 3784).

Desmometopa tarsalis Loew

Curran 28-68: on Desecheo Id.

Phleomyia indecora Loew

(as *Milichia*) Coquillett.

Curran 28-68: at Mayagüez and on Mona Id.

on weeds at Caguas (I No. 4284); on *Crotalaria* blossoms at Barceloneta (I No. 4025).

HIPPOBOSCIDÆ

Lipoptera sp.

on P. R. Sparrow Hawk at Las Marías xii-26.

Ornithoetona erythrocephala Leach

(as *Ornithomyia cryptocephala* Leach) Stahl.

Roeder. Gundlach, "Se encuentra en aves de diferentes familias."

Coquillett on sparrow hawk.

AMC: at Lajas III-30 det. Curran, from W. I. Red-tailed Hawk at Las Marías III-31.

Lynchia maura Bigot—det. J. M. Aldrich

AMC: at Río Piedras V-30, San Germán 83-24 XII-32, Mayagüez IX-319 Coamo VII-22: from domestic pigeon. from domestic pigeon (8-21).

Olfersia albipennis Say

collected by Mr. Alex Wetmore at Río Piedras, Dec. 22, 1916.

Olfersia diomedeeae Coquillett

AMC: from Booby on Desecheo Id., v-27 det. J. M. Aldrich.

Melophagus ovinus Linne

Van Z. (P. R. 91) on sheep.

STREBLIDÆ

Trichobius dugesii Townsend

(as *Strebla vespertilionis* (as Fallen) Fabr.) Gundlach, "Vive sobre los murciélagos".

Coquillett.

Aspidoptera busckii Coquillett, D. W., "New Genera and Species of Nycteribidae and Hippoboscidae", Can. Ent., Vol. XXXI, pp. 333-336, No. 1899. TYPE from Bayamón, P. R., on bats (*Artibeus* sp.)

Pterellipsis araeneae Coquillett, D. W., 90-334, TYPE from Porto Rico: on bats.

SIPHONAPTERA

Cox, O. H.,
Carrion, A. L., &
Fox, C.,
28-

"Rat-Flea Survey of the Port of San Juan, Porto Rico—a Preliminary Report". Public Health Reports, Vol. 43, No. 11, pp. 611-616, 2 charts. Washington, D. C., March 16, 1928.

Carrion, A. L.,
27-

"Preliminary Report on a Rat and Flea Survey of the City of San Juan, Porto Rico". P. R. Rev. Public Health & Tropical Medicine, Vol. 3., No. 2, pp. 131-145. San Juan, August 1927.

28-

"Preliminary Report on a Rat-Flea Survey of the City of San Juan, Porto Rico. Second Paper". P. R. Rev. Public Health & Tropical Medicine, Vol. 4, No. 2, pp. 84-92. San Juan, August 1928.

29-

"Third Report on a Rat-Flea Survey of the City of San Juan, Porto Rico". P. R. Jour. Public Health & Tropical Medicine, Vol. 5, No. 2, pp. 158-166, 7 charts. San Juan, August 1929.

32-

"Final Report on a Rat-Flea Survey of San Juan, Porto Rico". Public Health Reports Vol. 47, No. 4, pp. 193-201, 5 charts. Washington, D. C., January 22, 1932: all the entomological data of the above papers in summarized in the following table:

TABLE 4.—TABULATION OF FLEAS AS TO SPECIES AND SEX

		1926-27	1927-28	1928-29	Total
<i>Xenopsylla cheopsis</i>	} ♂ } ♀	1,472 1,067	1,484 1,092	1,085 870	4,011 3,029
<i>Echidnophaga gallinacea</i>	} ♂ } ♀	4 31	1 18	5 34	10 83
<i>Otanocephalus canis or felis</i>.....	} ♂ } ♀	..... 1	1 1	2 2	3 4
<i>Pulex irritans</i>.....	} ♂ } ♀	..... .....	..... 2	1 1	1 3
<i>Leptopsylla musculi</i>.....	} ♂ } ♀	..... .....	1 .....	..... .....	1

LEPTOPSYLLIDÆ

Leptopsylla segnis Schönherr (musculi Duges)

Carrion 28-: 1 on rat.

Carrion 32-195: one on 1,005 rats.

ECHIDNOPHAGIDÆ

Tunga penetrans L.

(as *Pulex*) Stahl—"nigua".

(as *Surcopsyllus*) Van Z. (1715), on man.

(as *Dermatophilus*) IP-237: "Common on man, usually after bathing on sandy beaches (Condado and Pt. Cangrejos), occasionally abundant on clay soil under houses. Supposed to cause large scabs on hogs. EEP-170: economic notes.

Van Volkenberg 32-26: on swine and man.

on pig at Mayagüez (Van Volkenberg) det. H. E. Ewing.

Echidnophaga gallinacea Westwood

(as *Sarcopsylla*) Van Z. (1719) on rat and fowls.

EEP-157: an economic, illustrated account.

Dikmans, G., "Report of the Parasitologist". in P. R. (Mayagüez) Agr. Expt. Station Report 1926, pp. 30-31. Washington, D. C., 1927: infestation on baby chicks.

Cox, Carrion & Fox 28-612: 35 from 360 rats.

Carrion 27-, 28-, 29-, and 32-195: 93 from 1005 rats.

on hen (321-23 det. F. C. Bishopp), at Mayagüez (H. L.

Van Volkenberg) det. H. S. Peters.



Echidnophaga gallinacea
Westwood. Greatly enlarged. (After Bishopp.)



Pulex irritans L. Greatly enlarged. (After Bishopp.)

PULICIDÆ

Pulex irritans L.

Stahl—"pulga".

EEP-170: economic notes.

IP-237: on man at Pt. Cangrejos, det. F. C. Bishopp.

Carrion 28-, and 29-, 32-195: four on 1,005 rats.

on man at Mayagüez (H. L. Van Volkenberg) det. H. E. Ewing.

Xenopsylla cheopsis Rothschild

Van Z. (1714) on rat.

Carrion 27- : practically all of this species from rats.

Cox, Carrion & Fox 28-612: 2,538 specimens from 193 rats.

Carrion 28- : 99.5% of 2,600 fleas from rats.

Carrion 29- & 32-195: 98.5% of all fleas caught on rats.

Ctenocephalus canis Curtis

Van Z. (1708) on dog.

EEP-170: economic notes.

Cox, Carrion & Fox 26-612: a single specimen from 360 rats.

Carrion 27- , 28- , 29- , 32-195: very few on rats.

Van Volkenberg 32-26: the only species on mongoose.

Ctenocephalus felis Bouché

Van Z. (1718) on rat.

Carrion 27- , 28- , 29- , 32-195: very few on rats.

on dog and calf at Mayagüez, (H. L. Van Volkenberg),

Bishopp No. 18773. det. M. A. Stewart.

LEPIDOPTERA

- Dewitz, H.,** "Tagschmetterlinge von Portorico." Stettiner Ent. Zeit., Vol. 38, pp. 233-245, pl. 1. Stettin, 1877.
- Dewitz, H.,** "Dämmerungs-und Nachtfalter von Portorico." Mitteilungen des Münchner Ent. Vereines, Vol. 1, pp. 91-96, pl. 1. Munich, 1877.
- Forbes, W. T. M.,** "Heterocera or Moths (excepting the Noctuidae, Geometridae and Pyralidae) Insects of Porto Rico and the Virgin Islands." Scientific Survey of Porto Rico and the Virgin Islands, N. Y. Academy of Sciences, Vol. 12, Pt. 1, pp. 171, pl. 2, ref. 52. New York, 1930.
- Forbes, W. T. M.,** "Supplementary Report on the Heterocera or Moths of Porto Rico." Jour. Dept. Agr. P. R., Vol. 15, No. 4, pp. 339-394, pl. 6. San Juan, November 1931. (also reprinted as Vol. 12 (Supplementary Part) Scientific Survey of Porto Rico and the Virgin Islands).
- Hampson, Sir George F.,** "Catalogue of the Lepidoptera Phalaenae in the British Museum." 13 vols. & 2 supps. London, 1889 to 1920.
- Möschler, H. B.,** "Die Lepidopterenfauna der Insel Portorico." Abhandlungen der Seckenbergischen naturforschenden Gesellschaft, Vol. 16; pp. 69-360. Frankfurt, 1891.

The original records in the original of this list of Lepidoptera were based mainly on material determined by Dr. Harrison G. Dyar and by Dr. Wm. Schaus, in the Sphingidae by Mr. B. Preston Clark, and in the Microlepidoptera by Mr. August Busck. Dr. Dyar also described a number of new species from material collected by entomologists at the Insular Station, while the second paper by Dr. Forbes contains descriptions or identifications of moths collected by himself and Drs. W. A. Hoffman and M. D. Leonard, and Messrs. F. Seín and A. S. Mills, or, after his departure, collected by Hoffman, Leonard or Seín. The material reported under Interception records has been identified by Dr. Dyar or Dr. Schaus, or by Mr. Busck or Mr. Carl Heinrich.

NYMPHALIDÆ

Danaïs cleophila Godart—det. W. Sheaus
adult on Lantana flowers at Ciales (I No. 4888).

Anosia plexippus Linnaeus

(as *Danaïs archippus* Fabr.) Dewitz. Stahl.

(as *Danaus crippus* Cramer) Möschler. Gundlach, "La oruga se cría en la *Asclepias curassavica*."

Van Z. (2002) on *Asclepias* sp.

Danforth 26-23: at Cartagena lagoon.

Sein, F., "Una Invasión de Mariposas". Rev. Agr. P. R., Vol. 22, No. 10, pp. 169-170. San Juan, 1929.

AMC: many records.

(158-12 det. H. G. Dyar, I No. 849), at Martín Peña (825-14), at Mameyes (:39-92) on *Lantana* flowers; larvae on *Asclepias curassavica* (320-12), on the giant milkweed, *Calotropis procera*, at Yauco and Ponce (GNW).

Lycorea cleobaea Godart

Dewitz. Stahl. Möschler. Gundlach.

Heliconius charitonius Linnaeus

Dewitz. Stahl. Möschler. Gundlach, "Es notable por la costumbre que tienen todas las de una localidad de reunirse por la tarde y dormir una al lado de otra. La oruga se cría en especies del género *Passiflora*."

Wolcott 32-409: on the plaza of Río Piedras after the hurricane of San Ciprián.

AMC: at Añasco x-30, ix-20, on six dates at Mayagüez.

(as *Apostraphia*) AMNH, at Aibonito.

(I No. 839), in clearings in the woods at Mameyes (801-12), Martín Peña (25-14), at Quebradillas (EGS), at Arecibo (GNW), at Guayanilla (501-23).

Eueides cleobaea Hübner

Dewitz. Stahl. Möschler. Gundlach, "La oruga se cría en especies del género *Passiflora*."

Colaenis cillene Cramer—det. W. Schaus

at Cidra (I No. 2803).

Colaenis delila Fabricius

Dewitz. Stahl. Möschler. Gundlach, "La oruga se cría en las *Passifloras*".

Colaenis julia Fabricius

Van Z. (P. R. 1419). AMNH at Aibonito and Mayagüez.

AMC: at Añasco xi-30, Mayagüez ix-30, iv-29, xii-30.

(I No. 848, 666-12), at Martín Peña (23-14), on El Yunque (47-24).

Dione vanillae Linnaeus

(as *Agraulis*) Dewitz. Stahl. Möschler. Gundlach, "La oruga se cría en las *Passifloras*."

Van Z. (P. R. 1427). AMNH at San Juan.

AMC: at Yabucoa xi-30, Añasco ix-20, on four dates at Mayagüez.

(884-14), larvae on *Passiflora* sp. (261-12, 700-16, I No. 1170 Leonard 32-135); adults at Mameyes on *Lantana* flowers (GNW), at Barceloneta (I No. 3836).

Euptoieta hegesia Cramer

Dewitz. Stahl. Möschler. Gundlach, "La oruga se cría en la planta *Turnera ulmifolia*." AMNH at San Juan.

Danforth 26-33: at Cartagena lagoon.

at Camuy (EGS), at Pt. Cangrejos (GNW).

Melitaea pelops Drury

Dewitz. Stahl. Möschler. Gundlach.

Phyciodes aegon F.—det. W. Schaus

(I No. 4582).

Phyciodes anocaona Herr. Sch.—det. H. G. Dyar.

on el Duque at Naguabo (730-14).

Synchlœ tulita Gundlach

Dewitz. Stahl.

(as *Coatlantona*) Möschler. Gundlach, "cerca de la costa."

AMNH at Tallaboa.

Hypanartia paullus Fabricius

(as *Heurema*) Stahl.

(as *Euroma tecmesia* Hbn. or *Terias*) Dewitz.

Möschler. Gundlach.

IP-140: larvae on *Trema micrantha* at Ciales (495-21 adult det. W. Schaus) and in mountains north of Yauco (57-23); description of larva and chrysalis.

at Adjuntas (I No. 3999).

Vanessa virginiensis Dry.—det. W. Schaus

at Cayey (I No. 5231).

Pyrameis cardui Linnaeus

Dewitz. Stahl. Möschler. Gundlach.

at Cayey (GNW).

Junonia coenia Hübner

Van Z. (P. R. 138).

(658-12, 75-19, I No. 847).

Junonia lavinia Cramer

Dewitz. Stahl. Möschler. Gundlach, "Esta especie varía mucho; pero no es igual a la *J. coenia*."

(887-14).

Junonia genoveva Cramer

Stahl. AMNH at San Juan.

Danforth 26-33: at Cartagena Lagoon.

AMC: at Añaseo ix-30, Yabucoa vii-30, Mayagüez iii-30.

(670-12), at Algarrobo (821-14); larvae on *Valerianoides jamaicensis* (692-16), on fog-fruit, *Lippia nodiflora*, at Pt. Cangrejos, in great abundance, March 1920 (GNW).

Larvae, black, spiny. Head shiny, deeply divided into two lobes, each with short spine. Body velvety, neck light chestnut in color, spines purplish, especially at base, the more ventral row short, yellow, black-tipped. Chrysalis, light and dark grey, spiny and elongate.

Precis zonalis Felder—det. W. Schaus

at Loíza (I No. 3865).

Anartia jatrophae Linnaeus

Dewitz. Stahl. Möschler. Gundlach. Van Z. (P. R. 139). AMNH.

Danforth 26-33: abundant about Cartagena Lagoon; larvae on *Lippia reptans*.

AMC: Mayagüez ix-30, vii-20, x-30, Yabucoa vii-3.

(104-12), at Algarrobo (820-14); larvae on water hyssop, *Bacopa monniera*; at Pt. Cangrejos, March 1920 (GNW).

Larvae black, spiny. Head shiny, with two large branched spines. Body with silvery spots, more abundant dorsally, warts on first segment, large branching spines on others. Chrysalis short and plump, light green or opaque greenish-purplish-black, with bloom.

Eunia monima Cramer

Dewitz. Stahl. Möschler. Gundlach.

adults abundant, with *E. tatila* H. S., along irrigation ditch and road to Tablon No. 13, Hda. Santa Rita, Guánica (729-July 13 to 17, 1915).

Eunica tatila Herr. Sch.

Dewitz. Stahl. Möschler. Gundlach.

at Guánica (729-15).

Gynaecia dirce Linnaeus

Dewitz. Stahl. Möschler. Gundlach, "La oruga vive debajo de hoja de *Cecropia*, comiendo las nervaciones gruesas".

Van Z. (P. R. 140).

in coffee grove at Consumo (27-35 det. F. E. Watson); on jazmin flower at Mayagüez (I No. 3282).

Didonis biblis Fabricius

(as *D. hyperia* Cr. & *Biblis thadana* Fabr.) Stahl.

Möschler. Gundlach. AMNH at Tallaboa.

Danforth 26-23: at Cartagena Lagoon.

AMC: at Mayagüez ii-27, Cartagena Lagoon xi-3.

at Quebradillas (EGS), at Arecibo (GNW).

Timetes chiron Fabricius

Dewitz. Stahl. (as *Megalura*) Möschler. Gundlach, "La oruga se cría en la *Maclura tinctoria* y acaso en el *Xanthoxylum*. El insecto suele posarse encima del fango para chupar."

Timetes petreus Cramer

(as *Marpesia*) Dewitz. Stahl.

(as *Megalura pteleus* Sulzer) Möschler. Gundlach.

two adults, one yellowish, one reddish, at Guánica (728-15).

Anaea (Pyrrhanaea) morrisoni Edwards

Van Z. (P. R. 1434).

Anaea portia Fabricius

Van Z. (P. R. 1413). AMC: at La Plata x-27.

at Guánica (727-15), resting on corn at Aguadilla (28-22),

at Ponce (135-13; larvae on *Croton* at Ponce, Guánica and Boquerón (GNW).

Ageronia ferentina Godart

Gundlach states specimens were collected by Dr. Stahl in Bayamón, and by Mr. Sintenis "en el interior de la parte oriental", but it is not mentioned in Stahl's list.

IP-313: on trunks of *Inga vera* in coffee grove at Aibonito January 29, 1924 (F. Seín).

AMC: unlabeled specimen.

Victorina steneles Linnaeus

Dewitz. Stahl. Möschler. Gundlach. Van Z. (P. R. 1416).

AMC: at Mayagüez vii-31, Jayuya ix-30.

IP-142: in mountains at Añasco (1005-13), in coconut grove at Pt. Cangrejos (GNW); larvae on *Blechnum brownei* in coffee grove at Lares (317-22), description of caterpillar and chrysalis.

Victorina lavinia F.—det. W. Schaus

at Adjuntas (I No. 4071).

Hypolimnas misippus Linnaeus

Stahl. (as *Diadema bolina* Linn.) Dewitz.

(as *Diadema*) Möschler. Gundlach.

male collected by Alan York at Cayey; female at Boquerón (29-23).

Heterochroa gelania Godart

Möschler. Gundlach. (as *H. arecosa* Doubl. West.) Dewitz. Stahl.

Apatura idyja Hübner

Gundlach. (as *Doxocopa*) Stahl.

Historis orion Fabricius

(as *Aganisthos odius* Fabr.) Stahl. Gundlach, "La oruga se cría en la *Cecropia*."

(as *Aganisthos*) Dewitz.

larva on *Cecropia peltata* (164-20, adult det. Schaus).
 "Flatfish, medium-gray, with white saddle 5 by 10 mm. at middle of back and two prominent projections, with spiny protuberances projecting upward and outward from the head, about 3 mm. long. In the fully-grown caterpillar the saddle was greyer and less conspicuous. The pupa, reddish-brown in color, had two double-curved projections 4 to 5 mm. long extending forward from the head and almost touching at their apex, but 2 mm. apart at base." E. G. Smyth.

Historis acheronta Fabricius

(as *Megistans cadmus* Gr.) Dewitz. Stahl. (as *M. acheronta* (as *S. idc*) Dewitz. Stahl. Möschler. Gundlach.

Prepona antimache Hübner

(as *P. amphiloe* God.) Stahl. Dewitz. Möschler. Gundlach.

Paphia troglodyta Fabricius

Dewitz. Stahl. Möschler. Gundlach.

Siderone nemesis Illiger (= *ide* Hübner) synonymy by F. E. Watson.

(as *S. idc*) Dewitz. Stahl. Möschler. Gundlach.

at Mayagüez (I No. 2679); at Lares & La Muda (56-35).

SATYRIDÆ

Calisto nubila Lathy, P. L. "Monograph of the Genus **Calisto** Hübner." Trans. Ent. Soc. London. Part 2, June 1899, pp. 221-228, pl. 1. TYPE from Porto Rico.

(as *Calisto zangis* Fabr. Dewitz. Stahl. AMNH at Aibonito.

(as *Calisto zangis* Fabr.) Möschler. Gundlach. Van Z. (P. R. 1419).

(668-12, 808-14, 885-14, I No. 858), at Trujillo Alto (895-det. Dyar), on El Duque, Naguabo (734-14), in mountains north of Yauco (296-21), on El Yunque (I No. 2018 Leonard 33-133), at Cidra (I No. 2624), at Arceibo (I No. 2599).

LIBYTHEIDÆ

Libethea motya Hübner

Dewitz. Stahl. Möschler. Gundlach.

LYCÆNIDÆ

Lycaena cassius Cramer

Dewitz. Stahl. Möschler. Gundlach.

at Camuy (EGS); on string beans at Manatí (I No. 1298 Leonard 33-144).

***Lycaena hanno* Hübner**

Dewitz. Stahl. Möschler. Gundlach. Van Z. (P. R. 132).
(I No. 856), at Algarrobo (813-14) at Loíza (I No. 4202), at
Villalba (I No. 4585), at Cidra (I No. 2910).

***Lycaena marina* Reakirt—det. W. Schaus**
at Camuy (EGS).

***Lycaena theonus* Lucas—det. W. Schaus**
Wolcott, G. N., "The Larvae of *Lycaena theonus* Lucas Feed on
the Buds and Flowers of Lima Bean and *Crotalaria incana*
in Puerto Rico." Jour. Agr. Univ. P. R., Vol. 18 No. 3, p.
435, ref. 1. San Juan, October 1934.
adults (I No. 2726); on *Crotalaria* flowers at Arecibo (I No
3637); in lima bean field at Pueblo Viejo (I No. 3851); in
casuarina nursery at Isabela (GNW); larvae eating buds of
lima beans (51-33), flowers of *Crotalaria incana* at Mameyes
(84-33).

***Eupsyche telea* Hewitson**
Dyar —36.

***Callicista columnella* F.—det. W. Schaus**
"dark brown, black spot on forewing", at Vega Baja (I
No. 5043).

***Thecla acis* Drury**
Dewitz. Möschler. Gundlach.
at Ponce (137-13).

***Thecla angelia* Hewitson**
Dewitz. Stahl. Möschler. Gundlach.
(I No. 2843), on mango blossoms at Mayagüez (I No. 3820).

***Thecla caelebs* Herr. Sch.**
Dewitz. Möschler. Gundlach, "La oruga come los botones de
Tetrapteris."

***Thecla cardus* Hewitson**
Dewitz. Stahl. Möschler. Gundlach.

***Thecla celida* Hewitson**
Dewitz. Möschler. Gundlach.

***Thecla cybira* Hewitson**
Dewitz. Möschler. Gundlach.

***Thecla eurytulus* Hübner—det. W. Schaus**
in *Crotalaria* flowers at Arecibo (I. No. 3633).

***Thecla limenia* Hewitson**
Dewitz. Stahl. Möschler. Gundlach.

***Thecla maesites* Herr. Sch.**
Dewitz. Stahl. Möschler. Gundlach.

Thecla telea Hewitson

Dewitz. Stahl. Möschler. Gundlach.

Thecla simaethis Drury

Dewitz. Stahl. Möschler. Gundlach.

at Arecibo (I. No. 3711).

PIERIDÆ

Leptalis (Dismorphia) spio Godart

Dewitz. Stahl. Möschler. Gundlach.

in coffee grove at Añasco (1006-13), on El Duque near Naguabo (736-14), common in August on El Yunque near Mameyes (EGS), on El Yunque in May (40-34), at Adjuntas (I No. 4072).

Pieris amaryllis Fabricius

(as *P. josephina* God., var *krugii* Dewitz) Dewitz. Stahl. Möschler. Gundlach.

Pieris joppe Boisduval

Dewitz. Stahl. Möschler. Gundlach.

at Vega Baja (I No. 3258).

Pieris monuste Linnaeus

Dewitz. Stahl. Möschler. Gundlach, "Muy abundante y dañina, porque la oruga vive en las coles y otras plantas crucíferas."

(as *Pontia*) Hooker 13-34: on cabbage.

Tower 08-35; on cabbage, radish, turnip, kale and mustard.

Jones 15-6; on horse radish and *Cleome spinosa*.

Cotton 18-281; figures of egg, larvae and adult—on cabbage.

EEP-111: on cabbage.

(760-12, 22-18, I No. 844); on bean at Palo Seco (I No. 326); on mustard at Vega Alta (I No. 3289-B); larvae on radish (145-12, 80-19), on turnip (222-12), on cabbage (634-17, 657-17); on *Cleome spinosa* at Canóvanas (291-13), at Carolina (30-15); on *Gynandropsis pentaphylla* (499-12, 514-12; on ? in mountains north of Yauco (76-23).

Pieris virginia Godart—det. W. Schaus

(I No. 2730).

Tachyris ilaire Godart

(as *T. margarita* Hbn.) Dewitz.

(as *Pieris*) Stahl.

(as *Daptonoura*) Möschler. Gundlach.

(as *T. margarita* Hbn.) Van Z. P. R. 134).

Phoebis agarithe Boisduval

(as *Callidryas*) Dewitz. Stahl. Möschler. Gundlach.

Van Z. (P. R. 1428).

AMC: at Mayagüez iii-30, Yabucoa xii-30, La Plata x-27.

Phoebis argante F.

(as *Callidryas*) Dewitz. Stahl. Möschler. Gundlach. IP-146: at Camuy (EGS).

(also as *C. rotata* Butler—det. W. Schaus “a female aberration of *argante* F.”) IP-146: larva on *Inga vera* at Cayey (33-21).

AMC: at Barros x-30, Añasco x-30, viii-30, Mayagüez xii-30, xi-30, x-30.

Phoebis eubule L.

(as *Callidryas*) Dewitz. Stahl. Möschler. Gundlach, “La oruga se cría principalmente en la *Cassia occidentalis*.” Val Z. (P. R. 1423) on *Cassia* sp. IP-146: (598-12, 759-12, 667-12, 72-19); larvae on *Cassia occidentalis* (892-13, 740-14, 701-16, 88-20); adults on flowers of *Herpetica alata* at Guánica (GNW).

Danforth 26-23: at Cartagena lagoon.

AMC: at Jayuya ix-30, Yabucoa vii-30, Cabo Rojo iii-30, Mayagüez viii-30, Añasco viii-30, ix-30, x-30, xi-30.

(as *P. e. sennae* L. female form *sennalba*, new form) Brown, F. Martin, “A Revision of the Genus *Phoebis* (Lepidoptera)”. Amer. Mus. Novitates No. 368, pp. 22, fig. 37, many ref. New York, September 5, 1929: TYPE from San Juan, P. R.

(I No. 843, 844); at Bayamón (I No. 2878).

Phoebis philea L.

(as *Callidryas thalestris* Hübner) Dewitz. Möschler. Gundlach, “La oruga se cría en varias especies de *Cassia* y en la *Poinciana*.”

Brown 29-9: synonymy.

Phoebis (Rhabdodryas) trite L.

(as *Callydryas*) Dewitz. Stahl. Möschler. Gundlach.

(as *P. (R.) trite watsoni* new subspecies) Brown 29-20: (TYPE from R. D.), others from Cayey and Adjuntas, P. R.

Aphrissa godartiana Swainson

Brown, F. Martin, “A Revision of the Genus *Aphrissa*.” Amer. Mus. Novitates No. 454, pp. 14, fig. 15, many ref. New York, February 9, 1931: on p. 5, listed from P. R.

Aphrissa statira Cramer

(as *Callidryas evadne* Bois.) Dewitz. Stahl.

(as *Callidryas*) Möschler. Gundlach, “La oruga se cría en las *Cassias*.”

(also, not in synonymy, as *C. neleis* Bois.) Dewitz. Stahl. Möschler. Gundlach.

Brown 31-7: synonymy.

Kricogonia castalia Fabricius

(as *Gonepteryx*) Dewitz. (as *Rhodocera* (*G.*) *lycide* God. = *c.* Fabr.) Stahl.

Möschler. Gundlach, "Vive más bien cerca de la costa."

(the absence of recent records is presumably due to the present scarcity of the host of the larva, lignum-vitæ. *Guaiacum officinale*, see Wolcott, G. N., "Notes on the Pierid Butterfly, *Kricogonia castalia* Fab. (Lepid.)." Ent. News, Vol. 38, No. 4, pp. 97-100. Philadelphia, April 1927: recording finding the larvae on lignum-vitæ and the migration of large swarms of the butterflies northward along the coast from the Cul-de-Sac Plain, Haiti.)

Anteos (Gonepteryx) clorinde Godart

Dewitz.

Anteos (Gonepteryx) maerula Fabricius

Dewitz. Möschler. Gundlach, "La oruga se cría en especies de *Cassia*."

Eurema portoricensis Dewitz (as *Terias*) 77-237: TYPE from P. R. (as *Terias citrina* Poey) Möschler. Gundlach.

Klots, A. B., "A Revision of the Genus *Eurema* Hübner." Ent. Amer. Vol. 9, No. 3, n. s., p. 132. 1929: only in P. R. at Manatí (I No. 4415).

Eurema elathea Cramer

AMNH

Eurema euterpe Ménétries

(as *Terias*) Van Z. (P. R. 135).

AMNH

(303-12, 258-17, I No. 845, 846), at Algarrobo (812-14), at Bayamón (I No. 4894), at Cidra (I No. 1936 Leonard 33-135), at Dorado (I No. 2742), at Arecibo (I No. 2598), at Luquillo (I No. 4915).

Eurema jucunda Boisduval & Leconte

(as *Terias ebriola* Poey) Dewitz. Stahl.

(as *Terias*) Möschler. Gundlach, "La oruga se encuentra sobre el *Desmodium*."

AMC: unlabeled specimen.

Eurema lisa Boisduval & Leconte (= *T. sulphurina* Poey)

(as *Terias*) Dewitz. Stahl. Möschler. Gundlach, "La oruga vive, según Boisduval, en la *Cassia* y *Glycine*."

AMC: at Yabucoa vii-30, Añasco ii-29, x-30, on four dates at Mayagüez.

Eurema palmira Poey

(as *Terias*) Dewitz. Stahl. Möschler. Gundlach, "Su oruga sobre el *Desmodium*."

at Vega Baja (I No. 3838), at Luquillo (I. No. 4914).

PAPILIONIDÆ

Papilio androgeus Cramer

Möschler. Cotton 17-121; "Caterpillars—abundant in one citrus grove)."

(as *P. polycaon* Cramer) Dewitz. Stahl. Gundlach, "Su oruga se cría en especies del género *Citrus*."

AMC: at Mayagüez viii-31.

Determined as var. *epidaurus* Godman & Salvin by Dr. Frank E. Watson.

EEP-66 and EEWI-448: a minor pest of citrus.

larvae on citrus (931-16), at Manatí (806-16), at Lares (161-22), at Isabela (143-31).

Papilio crespontinus Martyn

(as *P. aristodemus* Esper) Dewitz.

(as *P. daphnis* Martyn—*P. aristodemus* Esper) Stahl.

Möschler. Gundlach.

Papilio pelaus Fabricius

Dewitz. Stahl. Gundlach, "He cogido una crisálida fijada en el tronco de un *Xanthoxylum*, y probablemente la oruga se cría en esta mata."

AMC: unlabeled specimen.

IP-147: at Martín Peña (24-14); twenty fully-grown larvae clustered on tree trunk of *Fagara* (*Xanthoxylum*) *martinicensis*, on web they had spun, unmoved by ant biting one or by a lizard running over the group, at Cayey (345-22); description of caterpillar.

on "cenizo" at Barranquitas (63-24).

Papilio polydamus Linneaus

Dewitz. Stahl. Möschler. Gundlach, "la oruga se cría en especies de *Aristolochia*. Exhala un olor a almizcle."

AMC: at Yabucoa VII-3; Mayagüez IX-30.

Papilio nitra Edwards

Van Z. (One specimen recorded by Dr. Hooker, Mayagüez, July 14, 1912.)

HESPERIIDÆ

Eudamus dorantes Stoll

(as *Goniurus*) Dewitz. Stahl.

(as *Goniuris*) Möschler. Grundlach.

Van Z. (P. R.)

at Ponce (I No. 4509): on *Crotalaria* flowers at Dorado (I No. 4921, 4922).

Eudamus santiago Lucas—det. W. Schaus

on lime flowers at Dorado (I No. 3611).

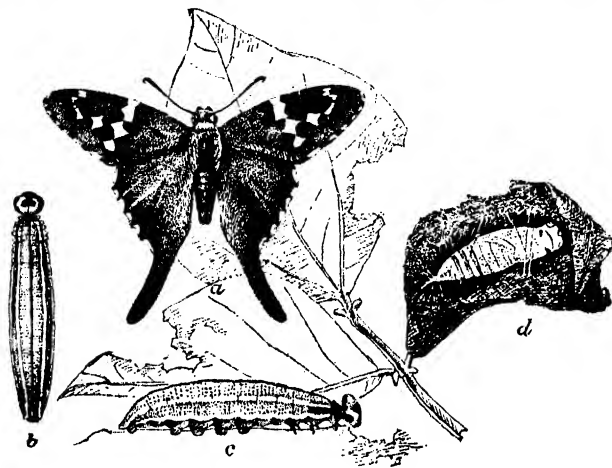
Goniurus proteus L.

Dewitz. Stahl. Möschler. Gundlach, "La oruga en papilionaceas (*Clitoria*)."

(as *Eudamus*) Van Z. (901) on beans. Hooker 13-14: mention.

Jones 15-7: on garden beans, cowpeas and *Phaseolus lathyroides*.
(as *Eudamus*) Cotton 18-277 & EEP-108: on beans.
Leonard 31-118 & 32-123: on beans.

on string beans (I No. 1295), at Loíza (I No. 3545); on lima beans at Cidra (I No. 2041), at Loíza (I No. 1686);



Goniurus proteus L., a, adult, b & c, larvae, d, pupa.
Natural size. (After Chittenden).

adults at Ponce (I No. 4571), at Caguas (I No. 4282), on Crotalaria flowers at Dorado (I No. 4923); (304-12, 671-12); on beans (851-16, 132-22), on beggar weed, *Meibomia tortuosa* (871-14, 348-16), on *Stigmaphyllon ligulatum* at Loíza (131-23).

Goniurus talus Cramer

(as *Goniloba*) Dewitz. (as *Eudamus*) Möschler. Gundlach,
"La oruga se cria en *Guarea trichilioides*".

Epargyreus zestos Hübner

(as *Goniloba*) Dewitz. Stahl.

(as *Aethilla*) Möschler. Gundlach.

at Cidra (I No. 2623), at Ponce (I No. 4583).

Acolastus amyntas Fabricius

(as *Goniloba* or *Erycides*) Dewitz.

(as *Goniloba savignyi* Encycl.—*amyntas* Fab.) Stahl.

(as *Hesperia*) Möschler. Gundlach.

adults common at Boquerón (25-23 det. Schaus); larvae on *Ichthyomethia piscipula* at Boquerón and Pt. Cangrejos, have flat, heart-shaped heads, black in earlier instars, lemon yellow in final instar with a large black spot on each side of the dorsal cleft (328-23); adults in grapefruit grove at Manatí (I No. 3063), at Mayagüez (I No. 3510).

Proteides jamaicensis Skinner—det. W. Schaus
at Peñuelas (I No. 4573).

Proteides idas Cramer

(as *Goniloba*—var. *pedro*) Dewitz. (as *Goniloba*) Stahl.

(as *Eudamus*) Möschler. Gundlach.

in grapefruit grove at Vega Alta (I No. 5853).

Telegonus anaphus Cramer

(as *Goniloba*) Dewitz. Stahl.

(as *Aethilla*) Möschler. Gundlach.

in grapefruit grove at Vega Alta (I No. 5352).

Melanthes brunnea Herr. Sch.

(as *Nisoniades* & in synonymy with *Antigonus pterus* Cr.) Stahl.

Eantis thraso Hübner

(as *Achylodes*) Dewitz. Stahl. Möschler. Gundlach.

Van Z. (22) on orange. AMNH.

Cotton 17-21: "fairly common in some (citrus) groves."

IP-149: larvæ on grapefruit leaves (9-20, 26-20), at Pt. Salinas (176-15), at Vega Alta (236-17); on wild orange at Aibonito (GNW), at Larcs (405-22), in mountains north of Yauco (365-21); on *Zanthoxylum (Fagara) monophyllum* at Boquerón (26-23); description of caterpillar and chrysalis.

EEP-66: on citrus. EEWI-450: in citrus nurseries.

(I No. 857), on lime at Dorado (I No. 4181).

Eantis papinianus Poey—det. W. Schaus

on *Crotalaria* flowers at Dorado (I No. 4920): on orange at Pueblo Viejo (I No. 2830).

Brachycorene arcas Drury

(as *Antigonus flyas* Cramer) Dewitz. Stahl.

(as *Antigonus*) Möschler. Gundlach, "La oruga se cría en especies de la familia de las apocíneas, v. g. del género *Echites*." With *Melanthes zepodea* Hübner, described from the female, in synonymy, as proved by rearing.

IP-149: at Ponce (138-13), at Pt. Cangrejos (646-21); larvae on *Stigmaphyllon ligulatum* at Pt. Cangrejos (88-16, 629-21), at Loíza (132-23, a male and a female, *Melanthes zepodea* Hübner, reared from caterpillars identical in appearance), at Boquerón (27-23); description of caterpillar and chrysalis.

Hesperia syrichtus Fabricius

(as *Pyrgus orcus* Cr.) Dewitz. Stahl. Möschler. Gundlach, "La oruga se cría en malvaceas, v. g. *Sida*."

Van Z. (P. R. 131) AMNH.

(I No. 860, 2600), at Naguabo on El Duque (737-14), at Algarrobo (815-14), at Cidra (I No. 3578), at Adjuntas (I No. 4581), at Quebradillas (EGS); larvae on *Sida carpinifolia* and *S. antillensis* (331-16, 368-16).

Pyrgus crisia Herr. Sch.

Dewitz. Möschler. Gundlach.

Nisoniades jaracco Lefebvre (in Lucas) = **N. juvenalis** Herr. Sch. Stahl.

Hylephilia phylaeus Drury

(as *Pamphila*) Dewitz.

(as *Hesperia*) Möschler. Gundlach.

Van Z. (P. R. 130). AMNH.

(156-12, I No. 2541), at Bayamón (I No. 3494), at Dorado (I No. 3606), at Vega Baja (I No. 3839), at Loíza (I No. 3863), at Villalba (I No. 4588); in grapefruit grove at Palo Seco (I No. 2834).

Atalopedes cunaxa Hewiston

(as *Pamphila mesogramma* Poey) Dewitz. Stahl.

(as *Hesperia*) Möschler. Gundlach, "el nombre *alameda* Lefebvre es anterior a *cunaxa* Hewiston".

(764-12 det. Schaus); at Villalba (I No. 4578).

Thymelicus brettus Boisduval

(as *Goniloba coccinea* Herr. Sch.) Stahl.

(as *Hesperia*) Gundlach.

Thymelicus dictynna G. & S.—det. W. Schaus

in orange grove at Pueblo Viejo (I No. 2837).

Choranthus haitensis Skinner—det. W. Schaus

(as poss. *C. ammonia* Plotz. det. Carl Heinrich) Wolcott 21-40: larva on sugar cane, life-history and description of stages.

EEWI-207: on sugar-cane.

Choranthus hesperia Plotz—det. W. Schaus

at Ponce (I No. 4580).

Choranthus hübnéri Plotz

(as *Hesperia*) Möschler. Gundlach.

(I No. 862, 2540); the unknown female ?, at Mayagüez (I No. 3069).

Catia otho Abbott & Smith

(as *Pamphila* or *Oligoria*) Dewitz.

(as *Hesperia*) Möschler. Gundlach.

(as *Catia druryi* Latr.) AMNH.

(432-12), on El Duque at Naguabo (731-14, 732-14, 733-14), at Algarrobo (819-14 det. W. Schaus); at San Juan (I No. 3107), at Ponce (I No. 4579), at Mayagüez (I No. 2552, 2969, 4743, 5834), at Arecibo (I No. 2586, 5362), at Dorado (I No. 2710, 3608, 3609), at Bayamón (I No. 2848), at Pueblo Viejo (I No. 2835, 2836).

Atrytone portensis Mabille—det. W. Schaus

at Bayamón (I No. 4329), at Arecibo (I No. 4974).

Atrytone vittellus Fabr.(as *Pamphila*) Dewitz.

Smyth 19-143: on sugar cane, Sudan grass and wild grasses.

Jones & Wolcott 22-42: on sugar cane, description of all stages.

EEWI-207: on sugar-cane.

larvae on sugar cane (29-14), adult (12-22 I No. 2543 Leonard 33-135), at Barceloneta (19-22), at Cayey (GNW), at Bayamón (I No. 5320), at Aibonito (I No. 4584), at Mayagüez (I No. 2554).

Lerodea tripuncta Herr. Sch.(as *Cobalus*) Dewitz. Stahl.(as *Hesperia*) Möschler. Gundlach.

(I. No. 859), at Quebradillas (EGS det. W. Schaus), at Pueblo Viejo (I No. 2833, 3849), at Ponce (I No. 4575), at Mayagüez (I No. 2968), on El Yunque (I No. 2019).

Calpodes ethlius CramerGundlach, "La oruga se alimenta de las hojas de *Maranta y canna*, y difiere por su forma, transparencia de la piel, y por la forma de la crisálida de las otras especies antillanas".Van Z. (1645) on *Canna coccinea*. Leonard 32-127: at Isabela.

EEWI-21: internal organs of larva visible thru its transparent skin.

all stages on *Canna edulis* at Pt. Cangrejos, eggs being parasitized by *Trichogramma pretiosa* Riley (190-15); larvae on *Canna* (47-16, 865-16), a serious pest on the cannas at the Union Club, Santurce, (JDM), which had to be sprayed with Arsenate of Lead; adult at Mayagüez (I No. 2555, 4546).**Prenes nyctelius** Latreille—det. W. Schaus

in grapefruit grove at Dorado (I No. 2711, 3064), at Vega Alta (I No. 5351); at Villalba (I No. 4577).

Prenes ares Felder

Van Z. (320) on grasses and sugar cane.

Jones 14-462; Smyth 19-143: on sugar cane.

Wolcott 21-38: on sugar cane, notes.



Head and thorax of larva of *Prenes ares*
Felder. Twice natural size. (Drawn
by Thos. H. Jones.)

Jones & Wolcott 22-41: description of all stages, notes, and illustrations of larva and pupa.

EEWI-205; a minor pest of sugar-cane.

on El Duque at Naguabo (734-14); larvae on sugar cane (151-12, 25-13, 1216-13, 1217-13, 1218-13), on coarse grass (34-13), at La Plata (157-17).

Prenes nero Fabricius

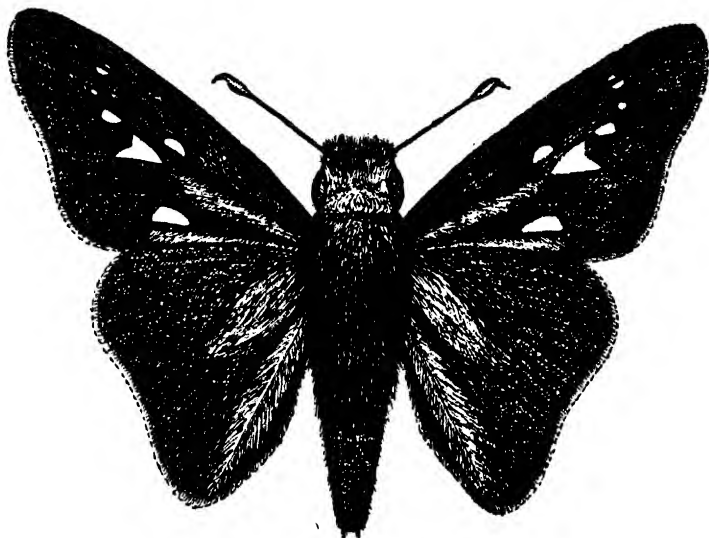
(as *Goniloba*) Dewitz.

(as *Hesperia*) Möschler. Gundlach.

(and as *Hesperia sylvicola* H. S.) Gundlach. Möschler.

(as *Goniloba sylvicola* H. S.) Dewitz. Stahl.

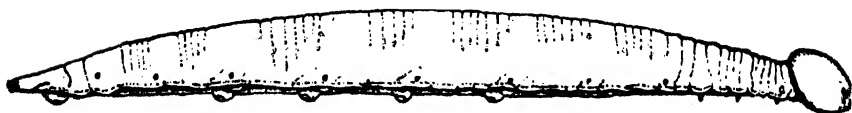
Van Z. (319) on sugar cane and grasses.



Prenes nero F. Twice natural size. (Drawn by Thos. H. Jones.)

Van Dine 13-34; Van Dine 13-257; Jones 14-462; Smyth 19-143: on sugar cane.

Jones & Wolcott 22-39: description of all stages and notes: larvae on sugar cane, rice, bamboo, malojillo, *Panicum barbinode*, grass and Johnson grass. Illustrations of larvae, pupa and adult.



Larva of *Prenes nero* L. Twice natural size. (Drawn by Thos. H. Jones.)

EEWI-205 to 206: a minor pest on sugar-cane.

(103-12); larvae on sugar cane (11-12, 5-13, 355-13, 979-13, 999-13, 1201-13, 1202-13, 9-14), at Luquillo (224-13), at Toa Alta (643-21); on *Panicum barbinode* (9-14); adults (I No. 861), in grapefruit grove at Dorado (I No. 3065), at Trujillo Alto (I No. 1697), at Ponce (I No. 4572, 4574), at Bayamón (I No. 3493 as *sylvicola* H. S. det. W. Schaus).

Prenes ocola W. H. Edwards

AMNH.

(I No. 2539), at Algarrobo (817-14), at Bayamón (I No. 2486), at Dorado (I No. 3607), at Mayagüez (I No. 2553); larva on sugar cane (119-12), on *Hymenachne amplexicaulis* (980-13).

Prenes parroquinoides Skinner

AMNH.

Cymaenes silius Latreille(as *Pamphila*) Dewitz. Stahl.(as *Hesperia*) Möschler. Gundlach.**Perichares corydon** Fabricius(as *Goniloba*) Dewitz. Stahl.

(as *Hesperia*) Möschler. Gundlach, "La oruga se cría en varias gramíneas de hojas no pequeñas, pues se esconde entre ellas reunidas con su seda, como todas las orugas de esta familia."

Van Z. (308) on sugar cane.

Wolcott 21-40: on sugar cane.

Jones & Wolcott 22-28 and EEWI-205: on sugar cane.

(1-21), at Ponce (I No. 4570, 4587), at Arecibo (I No. 4939); larvae on sugar cane at Arecibo (127-13), at Toa Alta (630-21, 645-21), at Guánica (18-22).

EUCHROMIIDÆ (SYNTOMIDÆ, AMATIDÆ)

Phoenicoprocta capistrana F.(as *Glaucopsis selecta* H. S.) Dewitz. Stahl Möschler. Gundlach.(as *Bombiliodes*) IP-156.

Forbes 30-20: AMC: at Coamo ii-29.

Phoenicoprocta parthenii F.(as *Glaucopsis multicincta* Walker) Dewitz.(as *Poecilosoma multicincta* Walker) Möschler. Gundlach.

(as *Mallodeta*) IP-156: at light (197-12), at Vega Alta (113-17), at Guánica (633-13 det. H. G. Dyar).

Forbes 30-20 & 31-341: at Aguadilla, Isabela, Coamo Springs.

AMC: at Coamo 11-29.

at Bayamón (I No. 3495).

Eunomia columbina F.

(as *Glaucopsis insularis* Grote) Dewitz. Möschler. Gundlach, "La oruga en las convolvulaceas".

(as *E. insularis* Grote) IP-156:

Forbes 30-22: at Maricao.

Nyridela chalciope Hübner(as *Glaucopsis*) Dewitz. Stahl.

(as *Isanthrene*) Möschler. Gundlach, "La oruga se cría en la *Cupania americana*".

Forbes 30-22 & 31-341: at Lares.

Cosmosoma auge L.

(as *Glaucopsis omphale* Hübner) Dewitz. Stahl.

(as *C. omphale* Hübner) Möschler. Gundlach, "La oruga se ería en la *Mikania*".

Van Z. (P. R. 1401). Forbes 30-23 & 31-341: at Coamo Springs, El Yunque and Lares.

AMC: at Mayagüez iv-29, iv-30, Peñuelas iii-27.

at light (144-16), at Bayamón (I No. 2482), at Arecibo (149-13), at Aibonito (SSC), at Utuado (WAH).

Cosmosoma achemon F., var. **tyrrhene** Hübner

(as *Glaucopsis tyrrhene* Hübner) Dewitz. Stahl.

Forbes 30-23 & 31-341: at Mayagüez; Coamo, San Germán, Cataño and Lares.

AMC: at Añasco x-30, Mayagüez xii-30.

at light at Bayamón (I No. 2845), at Arecibo (151-13).

Lymire flavicollis Dewitz 77-94 (as **Echeta**): TYPE from P. R.

(as *Echeta*) Stahl. Möschler. Gundlach.

(also, not in synonymy, *Echeta albipennis* H. S.) Dewitz. Stahl.

(also, not in synonymy, *L. albipennis* & *L. melanocephala* Walker—det. W. Schaus) 1P-157.

(as *L. senescens* sp. nov.) Forbes, W. T. W., "Notes on West Indian Syntomidae and Aretiidae (Lepidoptera)". Bull. Amer. Mus. Nat. Hist., Art. 14, No. 37, pp. 339-345. New York, 1917: on p. 345, TYPE from Naguabo, P. R.

Forbes 30-24: synonymy; at Coamo Springs.

Forbes 31-341: on El Yunque.

AMC: at Mayagüez v-28.

reared from pupa on cucumber leaf at Caguas (I No. 1849 Leonard 33-135).

Horama panthalon Fabr.

Dewitz. Möschler. Gundlach.

Forbes 30-25: at Coamo Springs and Manatí.

Forbes 31-341: at San Germán: great variation.

AMC: at Ponce ix-30 i-31, Mayagüez x-26, ix-30, Coamo Springs ix-30, Añasco ix-30, Algarrobo iv-30.

abundant at Boquerón (31-Jan. 9, 1923).

Horama pretus Cramer

Dewitz. Stahl. Möschler. Gundlach.

Van Z. (P. R. 151).

Forbes 30-25: at Mayagüez & San Juan.

AMC: at Maricao i-29, Humacao xi-30, Mayagüez ii-29, iv-29, i-29, xi-30.

at light (283-12), at Guánica (682-13); in coitu, feeding at flowers of *Tournefortia* sp. at Pt. Salinas (235-16); at flowers at Boquerón (30-23); larvae on *Elaeodendrum xylocarpum* at Pt. Cangrejos (858-16), at Boquerón (111-23).

Fully-grown larvae are about 15 mm. long and 7 mm. wide, bright reddish-orange, reddest on thorax and head, shining. Body clothed with numerous spreading tufts of grey and white hairs, curved towards their tips. On the seven anterior abdominal segments dorsally are four compressed tufts of black hair in pairs, bending towards each other, the anterior pair of each segment closer together and touching at apex.

Cocoon of thin grey silk with the longer hairs from the larva entangled in it. Pupa bright reddish brown.

Empyreuma pugione Linn.

Dewitz. Stahl. Möschler. Gundlach, "*Oruga en Nerium*".

(as *E. lichas* Cramer) Van Z. (1634) on oleander.

Van Zwaluwenburg 16-45: Eggs round, yellow—brown before hatching—slightly iridescent, finely sculptured with dull sheen, regularly spaced in groups on under side of leaf. Larvae dull orange, hairy, with silvery lateral stripes. Larval stage 26 days, pupal stage 13 days. Adult has crimson wings and dark-blue body.

Forbes 30-26: at Mayagüez.

AMC: at Mayagüez xi-30, Coamo ii-29.

at light (107-16, I No. 871 as *E. affinis* R. det. W. Schaus), at Bayamón (I No. 4041); larvae on oleander (91-21), at Santurce (78-33), at Arecibo (184-19).

Correbidia terminalis Walker

(as *Charidea cimicoides* Herr. Sch.) Dewitz. Stahl. Möschler. Gundlach, "La oruga----vive en la cara inferior de las hojas de *Cecropia*, formando luego un capullo poco primoroso".

Forbes 30-27: on El Yunque. Forbes 31-341: at Lares.

Correbidia bicolor Herr. Sch.

(as *Charidea*) Möschler. Gundlach.

Forbes 30-27: "possibly an extremely light form of the preceding."

NOLIDÆ

Celama sorghiella Riley

(as *Nola portoricensis* sp. nov.) Möschler 89-118: TYPE from P. R. Gundlach.

Forbes 30-28: at Mayagüez.

at light at Bayamón (I No. 2947, 3322, 3331, 3332, 3334); larvae common in arrows of sugar-cane (85-19, 382-22 det. W. Schaus).

Nola bistriga Möschler (as *Stenola*) 89-119: TYPE from P. R.

(as *Stenola*) Gundlach.

Forbes 30-29 & 31-341: on El Yunque.

Nola sinuata Forbes 30-29: TYPE from Coamo Springs, P. R.

Forbes 31-341.

ARCTIIDÆ

Lycomorphodes strigosa Butler

(as *Lycomorpha fumata* sp. nov.) Möschler 89-114: TYPE from P. R. Gundlach. IP-158.

Forbes 30-31: synonymy.

Progona pallida Möschler (as **Delphyre**) 89-118: TYPE from P. R. Gundlach. Forbes 30-32: at Cayey.

Forbes 31-342: common; at San Germán, Lares, Dorado and on El Yunque.

at light at Bayamón (I No. 2313, 2643, 2794, 2798, 2860, 5338).

Agylla sericea Druce

(as *Gnophria limpida* sp. nov.) Möschler 89-117: TYPE from P. R. Gundlach.

Forbes 30-32: "The Porto Rican record is based on a single specimen and there may be some error."

Paramulona albulata Herrich-Schäffer

(as *Mieza*) Dewitz. Stahl.

Forbes 30-33.

Mulona nigripunctata Hampson 98-387: ? TYPE from P. R.

Forbes 30-33: at Manatí.

Forbes 31-342: at Lares, San Germán and Palmas Abajo (WAH).

at light (I No. 3110) at Bayamón (I No. 3318, 4327, 4328).

(Cincia conspersa Walker

Möschler. Gundlach, with *Mieza albulata* H. S. in synonymy.

Forbes 30-33: in error for *Mulona nigripunctata*.)

Afrida charientisma Dyar

(as *A. tortriciformis* Möschler) Möschler. Gundlach. IP-158.

Forbes 30-34 & 31-324: on El Yunque.

at light at Bayamón (I No. 2743, 2745, 4672).

Euspseudosoma involutum Sepp

(as *E. nivea* H. S.) Dewitz. Stahl. Möschler. Gundlach, "La oruga en *Psidium*."

Forbes 30-34 & 31-342: at Mayagüez and Lares; larva on *Eugenia* and guava.

beautiful brown hairy larva on guava (74-21), at Caguas (138A-16).

Ammalo insulata Walker

(as *Pareuchaetes cadaverosa* Cramer and *P. affinis* Grote, not in synonymy) Dewitz. Stahl. Möschler. Gundlach, "La oruga

vive en *Vernonia*, *Eupatorium*."

Forbes 30-35 & 31-342: at Cataño.

AMC: at Coamo xii-28, x-26, i-29.

on weeds (889-14), on grass (307-16), at Aibonito (SSC);
at light at Guánica (1061-13 det. F. E. Watson), at Bayamón
(I No. 3498); reared from pupa at Pt. Cangrejos (GNW).

Phegoptera bimaculata Dewitz (as **Halisdota**) 77-95: TYPE from
P. R. Möschler. Gundlach.
(as *Opharus*) IP-159.

Forbes 30-36: "The Porto Rico record is based on Dewitz' type
alone."

Forbes 31-342: (from Jamaica.)

Microdota hemiceras Forbes 31-343: TYPE from San Germán,
another from Coamo Springs, P. R.

Halysidota cinctipes Grote

(as *Halisdota*) Dewitz. IP-159.

(as *H. tessellaris* Hübner) Möschler. Gundlach, "La oruga vive
probablemente en *Hibiscus*."

Forbes 30-36: "The caterpillar is black and red-brown—it eats
Coccoloba."

Forbes 31-343: at Lares.

Calidota strigosa Walker

(as *Halisdota*) Dewitz. Stahl. Möschler. Gundlach.

Forbes 30-37: "Caterpillar on *Guettarda elliptica*; red-brown
with shining black head."

Forbes 31-343: at Coamo Springs.

AMC: at Mayagüez xii-30.

(one unlabeled specimen.)

Ecpantheria icasia Cramer

(and as *E. eridane* Cr., not in synonymy) Dewitz. Stahl.
Möschler. Gundlach.

(as *E. eridanus* Cramer) Van Z. (1630) on *Erythrina microp-*
teryx, *Ipomoea* sp., orange and banana. (Synonym of *E. icasia*
—reared from same egg cluster and mated.)

Van Zwaluwenburg, R. H., "Notes on the Life History of *E-*
cpantheria eridanus Cramer." In *Insecutor Inscitiae Menstruus*
Vol. 4, Nos. 1-3, Jan.-March, 1916, pp. 12-17: an extended
account, giving additional host plants as vanilla and *Cissus*
sicyoides, description of all stages, life history and *Eremotylus*
angulatus Hooker as a parasite of the larva.

Cotton 18-285 and EEP-115: as a pest of celery, attacking the
stalks.

Wolcott 24-31: eaten by *Anolis cristatellus*.

Forbes 30-37: notes and locality records.

Forbes 31-343: at San Germán, Lares, Jájome Alto and on **El**
Yunque.

EEWI-612: a minor pest on beans and other vegetables.

AMC: at Santurce ii-30, Ponce xii-31, Barranquitas xii-30, and
on five dates at Mayagüez.

at light (6-20); at Guánica (651-13); at Juncos (40-19); at Isabela (GNW); at Aibonito (SSC); pupa under loose bark on tamarind tree at Toa Baja (45-15); larvae on egg-plant, bean, tomato (100-16). on *Erechtites hieracifolia* (818-16), on celery, injuring the stalks (62-17, 205-17), not on host (539-12); eating lima beans at Isabela (GNW); egg-cluster on *Psidium guajava*, from which 2,450 larvae hatched (13-17); adult resting on grapefruit at Bayamón (I No. 2478).

Utetheisa ornatrix ornatrix L. and **o. strechii** Butler

(as *Depiopoia*) Dewitz.

(and as *Callimorpha*) Stahl.

Möschler. Gundlach. "La oruga se cría en *Crotalaria*."

(and as *U. venusta* Dalm. (P. R. 137) Van Z. (2006) on *Crotalaria*).

Forbes 17-339 to 345: discussion of races.

Forbes 30-39 & 31-343: notes on races; locality records.

Leonard & Mills 31-473 and Leonard 32-131 & 33-113: on *Crotalaria*.

Faxon & Trotter 32-446: "generally infesting *Crotalaria*."

Wolcott 33-250: differentiating injury of larvae from that of *Etiella* in *Crotalaria* pods.

AMC: at Caguas xii-33, Montoso ix-32, Añasco x-30, on three dates at Mayagüez.

(761-12, 738-14), at Mameyes (802-12), at light (367-12, 53-17), at Guánica (561-13); in grapefruit grove at Bayamón (I No. 532), at Arecibo (I No. 1017), at Cayey (I No. 3414); larvae on *Crotalaria retusa* (856-14, 44-15), at Isabela (433-21, at Guánica (701-14); at Mayagüez (I No. 5818), at Bayamón (I No. 21); on string bean at Loíza (I No. 3864 Leonard 32-123).

PERICOPIDÆ (HYPSIDÆ in part)

Composia sybaris Cramer

Dewitz. Stahl. Möschler. Gundlach.

(as *C. fidelissima* H. S.—det. W. Schaus) IP-179: at light at Arecibo (149-13); flying about in bright sunlight and feeding at Lantana flowers in opening in palm grove on the beach at Mameyes (337-22).

Forbes 30-40: at Coamo Springs. Arecibo, Quebradillas and on Vieques Id.

AMC: at Maricao i-29.

(I No. 838), in grapefruit grove at Dorado (I No. 4179).

Otenuchidia virgo virginalis Forbes 30-42, pl. 1, fig. 1: new race, TYPE from Maricao, others from Yauco, P. R.

(as *Composia subcyanea* Walker det. H. G. Dyar) IP-179: on grass and weeds in abandoned coffee grove in the mountains north of Yauco (246-22 ALLOTYPE).

Hyalurga vinosa Drury

(as *Lauron*) Dewitz. Stahl. Möschler. Gundlach, "La oruga en *Tournefortia* y *Heliotropium*".

(as *Lauron*) Van Z. (P. R. 123) on *Heliotropium indicum*.

Jones, Thos. H., "Some Notes on the Life History and Habits of *Lauron vinosa* Drury". Insector Insectiae Menstruus, Vol. 2, No. 7 pp. 108-111. Washington, D. C., 1914: description of all stages.

(as *Lauron*) IP-178: (26-12, 521-12, 953 to 985-13, 876-13, 977-13, 986-13, 989-13, 496-16).

Forbes 30-42 & 31-344: notes on variation and immature stages, locality records; on Culebra Id. (A. Busek).

AMC: at Humacao xi-30, Luquillo vi-32, vii-32, Coamo ii-29, Mayagüez x-30, xi-30.

(I No. 1814), at light at Bayamón (I No. 2847), at Ponce (I No. 4589); larvae eating leaves of *Schobera angiosperma* at Bayamón (I No. 3969-B).

AGARISTIDÆ (PHALAENOIDIDÆ)

Tuerta sabulosa Boisduval

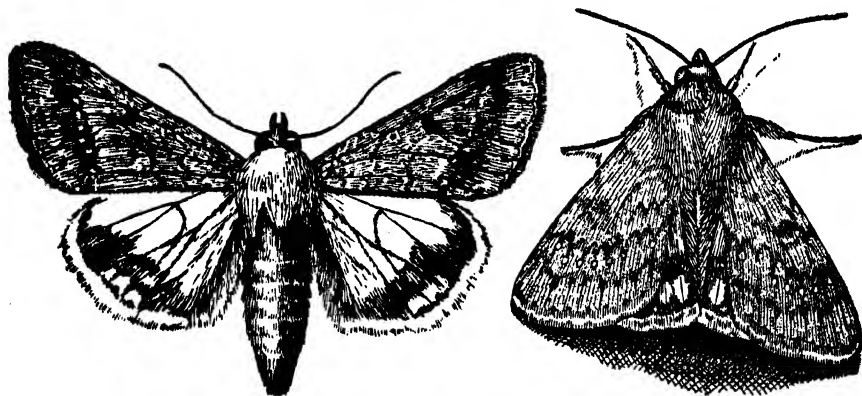
(as *Agarista noctuiformis* sp. nov.) Möschler 84-112: TYPE from P. R. Gundlach.

(as *T. (A.) noctuiformis* Möschler—det. W. Schaus) IP-160: one unlabeled specimen.

Forbes 30-43: synonymy; at Coamo Springs and Guánica.

Forbes 31-344: at San Germán.

NOCTUIDÆ



Heliothis obsoleta F. Twice natural size. (After Quaintance.)

Heliothis obsoleta F.

(as *H. armigera* Hübner) Stahl. Möschler. Gundlach, "En las mazorcas del maíz y en las capsulas del algodón".

Barrett 03-443, May 06-13, Jones 15-7, Cotton 18-289, Smyth 20-121, EEP-41 & EEWI-252 to 256: a serious pest of corn, attacking the ear.

Van Z. (906) on sugar-cane.

Van Zwaluwenburg 15-35: attacking corn, tobacco buds and seed pods, and tomatoes.

Leonard & Mills 31-472: in string beans.

Faxon & Trotter 32-446: in vegetables.

Leonard 32-122, 135, 141: on beans, corn, peppers and tomato.

EEWI-613: in pods of snap beans.

adult at light at Guánica (668-13); larva in corn ear (223-12, 1 No. 1201), at Añasco (1 No. 2014), at Barranquitas (1 No. 3554), in greatly varying abundance at Isabela (GNW); in peppers (1 No. 1265); in eggplant fruit at Cidra (1 No. 1025); in tomato fruit at Manatí (1 No. 1089), at Arecibo (1 No. 3787), at Guaynabo (1 No. 3783); eating green peas at Bayamón (1 No. 3360); in green string beans (1 No. 1080, 1090); in pigeon peas at Carolina (1 No. 3682), at Guayama (1 No. 1149), at Ponce (1 No. 5118), at Lajas (1 No. 3809), at Isabela (1 No. 5155), at Lares (1 No. 3574).

Chloridea virescens F.

Möschler. Gundlach, "La oruga es muy dañina, principalmente al tabaco, pues vive en el cogollo y luego también en las cápsulas. Lo mismo en las cápsulas de *Hibiscus*, *Sesamum* y otras plantas. Una oruga que llevaba en la mano me mordía puesta con otras orugas se las comía".

Van Z. (1627) on *Caján cajan*.

Leonard & Mills 31-473, Faxon & Trotter 32-446 & Leonard 32-136 & 33-122: in pigeon peas.

Leonard 31-119: eating cowpea pods.

EEWI-560: not a pest of tobacco since Gundlach's time.

eating pigeon peas out of pods, at Loíza (5-24), and thirty interception records, at Isabela, Aguadilla, San Sebastián, Las Marías, San Germán, Ensenada, Peñuelas, Ponce, Juana Díaz and Aguas Buenas.

Feltia annexa Treitschke

(as *Agrotis*) Stahl. Möschler. Gundlach, "La oruga vive durante el día al pie de plantas tiernas y sale al oscurecer para comer el tronco tierno. Causa daño en las huertas".

Jones 15-8: mention. Wolcott 22c-12: as a pest of tobacco and methods of control, illustration of larva, the "cuerudo" of tobacco growers.

EEP-93 & EEWI-555: "cuerudo" of tobacco, an economic account.

Wolcott 28-51: weight of tobacco leaf eaten by larva.

at light at Guánica (676-13 det. F. E. Watson); larvae on alfalfa at Fajardo (337-13 det. H. G. Dyar); larvae on tobacco at Cayey (73-21, 383-22, 8-23), at Caguas (150-21), at Corozal (Juan López), at Manatí and at Hatillo (GNW).

Rhynchagrotis ormalis Grote, var. **fecula** Grote
Dewitz.

Agrotis apicalis Herr. Sch.
Möschler. Gundlach.

Agrotis repleta Walker—det. H. G. Dyar
larva on sugar cane (150–12).

Agrotis submucosa Herr. Sch.
Möschler. Gundlach.

Lycophotia infecta Ochsenheimer
(as *Agrotis incivis* Guenee) Möschler. Gundlach.
Van Z. (1509) on millet, grass, seed cane.

(I No. 865), at light at Bayamón (I No. 2731, 3103), at
Guánica (629–13 det. H. G. Dyar); pupa in tobacco field at
Cayey (346–22 det. W. Schaus):

Miselia parvula Herr. Sch.
(as *Mamestra*) Möschler. Stahl. Gundlach.
at light (1009–16); larvae on *Solanum nigrum* (310–16,
373–16), at Isabela (503–18).

Tiracola plagiata Walker
(as *Agrotis grandirena* Herr. Sch.) Möschler. Gundlach.

Xanthopastis timais Cramer
(as *Euthisanotia* Stahl. Möschler. Gundlach, “La oruga se
alimenta de las hojas y cebollas de amarillideas”).
Van Z. (1624) on *Hibiscus rosa-sinensis* and *Xanthosoma* sp.
adult at light (I No. 1684); larvae on the White Spider
Amaryllis, *Hymenocallis expansa*, (54–16, 132–16, I No. 1591
Leonard 33–125), at Pt. Salinas (185–15), at Mayagüez (I
No. 2712, 4336); on tuberose, (I No. 1740). A common pest
of this plant along the beach of the north coast.

Cirphis clarescens Herr. Sch.
(as *Leucania*) Möschler. Gundlach.

Cirphis inconspicua Herrich-Schäffer
(as *Leucania*) Stahl. Möschler. Gundlach.

Cirphis latiuscula Herr. Sch.
(as *Leucania*) Stahl. (as also as *L. punctifera* Möschler and
as *L. senescens* Möschler. 89–142, TYPE from Porto Rico, not
in synonymy) Möschler. Gundlach.
Van Z. (2010) on sugar cane, grasses.
Van Dine 13–257; Van Dine 13–33; Jones 14–462; Smyth 19–
144: on sugar cane. Jones & Wolcott 22–43: description of

larva and adult, larva feeds on older leaves of sugar cane and is parasitized by *Apanteles marginiventris* Cresson, *Euplectrus* sp., and a Tachinid fly, *Compsilura oppugnator* Walton.

EEP-39: an economic account as a pest on sugar-cane.

Vickery, R. A., "Observations on *Cirphis latiuscula* H. Sch. in the Gulf Coast Region of Texas". Jour. Agr. Research, Vol. 32, No. 12, pp. 1099-1119, fig. 3, ref. 14. Washington, D. C., June 15, 1926: on p. 1100, under "Economic History" a summary of P. R. records.

abundant at light (159-32), at Guánica (638-13), at Bayamón (I No. 3175); larvae on sugar cane (224-11, 50-12, 101-12, 673-12, 37-13, 1219-13), at Toa Baja (29-15), at Vega Alta (18-13), at Mayagüez (79-19), at Santa Isabel (466-13).

Cirphis microsticha Hampson—det. W. Schaus
at light at Bayamón (I No. 3499).

(*Cirphis phragmitidicola* Guenee
(as *Leucania* Möschler. Gundlach.)

Cirphis secta Herr. Sch.
Stahl. (as *Leucania commoides* Guenee) Möschler.
(as *Leucania*) Gundlach.

Cirphis unipuncta Haworth
(as *Leucania extranea* Guenee) Stahl. Möschler. Gundlach.
at light at Guánica (667-13); larvae on grass at Cayey
(191-12).

(*Heliophila rimosa* Grote
Dewitz.)

Magusa orbifera Walker
(as *Laphygma angustipennis* Möschler) Möschler. Gundlach.

Cobaliodes tripunctus Hübner
Dewitz 77-243.

Perigera albigera Guenee
Möschler. Gundlach.

Perigea apameoides Guenee—det. F. E. Watson
at light at Guánica (1064-13), at Bayamón (I No. 2499,
2638, 2739, 2865).

Perigea concisa Walker—det. F. E. Watson
at light at Guánica (1064-13), at Bayamón (I No. 2734,
3369).

Perigea circula Guenee
Stahl. Möschler. Gundlach.
(One unlabeled specimen—det. W. Schaus.)

Perigea cupentia Cramer

(as *Craniophora*) Möschler. Gundlach.

(as *P. infelix* Guenee) Stahl.

larva on *Pluchea purpurascens* (811-16 det. W. Schaus, 327-23); adult at light at Bayamón (I No. 3740).

(Perigera stelligera Guenee

Möschler. Gundlach.)

"Wrongly identified by Möschler." W. Schaus.

(Perigera subaurea Guenee

Stahl. Möschler. Gundlach.)

"Wrongly identified I think." W. Schaus.

Perigea sutor Guenee—det. F. E. Watson

larvae on *Pluchea purpurascens* (790-16); adult at light (I No. 2776), at Bayamón (I No. 3531. 3532).

Perigea punctirena Walker

(as *Hadena*) Möschler. Gundlach.

Eriopus floridensis Guenee

(as *E. elegantulus* Herr. Sch.) Möschler. Gundlach, "Criado en *Aspidium*".

larva on fern (276-22 det. W. Schaus); adult at light at Bayamón (I No. 3224).

Eriopus jamaicensis Möschler

Möschler. Gundlach.

Agripodes jucundella Dyar, H. G., Insecutor Inscitiae Menstruus, Vol. 10, No. 10, 1922: TYPE from P. R.

larva on lichen on trees in mountains north of Yauco (338-21 TYPE) is grey-green and dark-brown to resemble the lichen, and forms a thin, tough cocoon in the lichen. The moth has the fore-wings light green, marked with black and white, hind-wings grey. Collected by Francisco Seín Jr.

Polyphaenis nona Möschler 89-131: TYPE from P. R. Gundlach.

Cephalospargeta elongata Möschler 89-120: TYPE from P. R. Gundlach.

at light at Guánica (644-13 det. H. G. Dyar).

Prorachia daria Druce—det. H. G. Dyar

at light at Guánica (653-13).

Catabena esula Druce—det. W. Schaus.

(One unlabeled specimen.)

Catabena vitrina Walker—det. W. Schaus.

(as *Calliarges divisa* Herr. Sch.) Möschler. Gundlach.

(One unlabeled specimen.)

Callierges recondita Möschler 89-140: TYPE from P. R. Gundlach.

Laphygma frugiperda Smith & Abbot

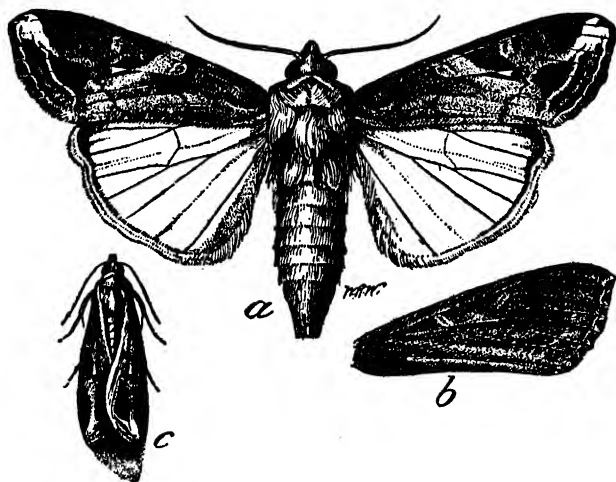
Stahl. Möschler. Gundlach. "La oruga daña a veces las siembras de maíz, caña y otras".

Van Z. (912) on sugar cane in seed beds, on *Panicum* sp.

Van Dine 13-31: Van Dine 13-257; Jones 14-462; Smyth 19-143: on sugar cane. Hooker 13-43: as "corn ear-worm".

Jones, Thos. H., "Some Notes on *Laphygma frugiperda* S. & A. in Porto Rico". in Jour. Ec. Ent., Vol. 6, No. 2, April 1913, pp. 230-236.

Jones 15-7: on corn and onions, attacked by three Tachinid



Laphygma frugiperda Smith & Abbot. Adult with folded wings (c) is natural size. (Drawn by W. R. Walton.)

parasites, one hymenopterous three predators and two fungi.

Johnston 15-18: and Stevenson 18-207: host of *Botrytis rileyi* Farl. at Río Piedras, and Guánica.

Cotton 18-288: on corn, native grasses, fruit of tomatoes and green pods of beans, quoted by Leonard & Mills 31-473.

Walcott 21-38: on sugar cane, malojillo grass; and corn.

Jones & Walcott 22-45 to 49: the most complete account, with illustration of all stages from Walton & Lugnibill.

EEP-39, 41 & 44: a pest of corn, of sugar-cane and of malojillo

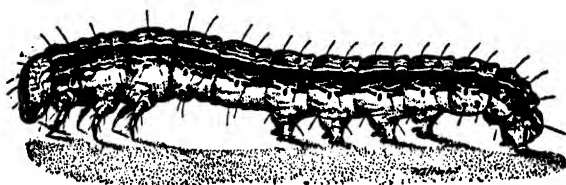
Walcott 24-6 8, 11, 17: parasites of and economic status; eaten by *Ameiva cressul* and *Anolis pulchellus*.

Leonard 32-121: on alfalfa.

Walcott 33-46: a pest of vegetables.

EEWI-208 to 212, 340 to 342 & 613; as a pest of sugar-cane; "It is doubtful if a single field of corn ever reaches maturity in the West Indies without being infested by *Laphygma*, and most corn suffers constant reinfestation". Inside lima bean pods.

adult (I No. 2782), at light at Bayamón (I No. 2484, 2854, 3328), at Guánica (67-19), resting on pepper at Bayamón (I No. 600), on eggplant at Isabela (I No. 1886), on *Solanus indicum* at Mayagüez (I No. 3250), on corn at Barceloneta (I No. 3290), on cucumber at Vega Alta (I No. 3461), on *Crotalaria* at Dorado (I No. 4924); larvae on sugar cane (161-12, 196-12, 216-12, 251-12), at Arecibo (176-11), at Ponce (736-12), at Mameyes (790-12), at Arroyo (938-13); eggs on sugar cane (345-12), at Guánica (128-13); larvae on corn (28-12, 217-12, 552-12, 635-17), at Loíza (I No. 2259), at Barceloneta (I No. 3302), at Moca (114-23); larvae on ma-



Larva of *Laphygma frugiperda* S. & A. Twice natural size. (Drawn by W. R. Walton.)

lojillo grass, *Panicum barbinode*, (23-12, 601-16, 637-16), at Mameyes (790-12); larvae on grass, *Eriochloa subglabra* (317-16), on meadow grass (151-21); on gramma grass, *Stenotaphrum secundatum* in a pasture at Hatillo (223-21); on rice (623-17); on alfalfa at Fajardo (336-13); eggs on *Phaseolus lathyroides* (which the larvae ate) at Canóvanas (125-13); larvae on banana (18-19), on eggplant (140-17); on cotton at Sabana Grande (550-21); eggs on post at Guánica (128-13); larvae burrowing in ground to eat eyes of seed cane at Juncos (142-32); burrowing in tomato fruits at Isabela (173-31); eating green beans in lima bean pods at Isabela (174-31, I No. 1774); burrowing in eggplant fruit at blossom or stem end at Isabela and ruining 75% of the crop for marketing, (GNW); eating onion leaves at Comerío (663-23), at Isabela (45-34).

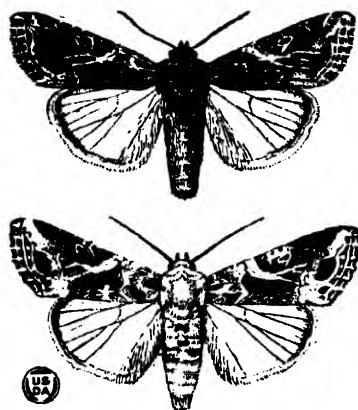
***Prodenia dolichos* Fabr.**

(as *P. commelina* S. & A.) Möschler. Gundlach.

***Prodenia pulchella* Herr. Sch.**

Möschler. Gundlach.

at light at Bayamón (I No. 2602, 2853).



Prodenia ornithogalli Guenee.
Twice natural size. (After
Chittenden.)

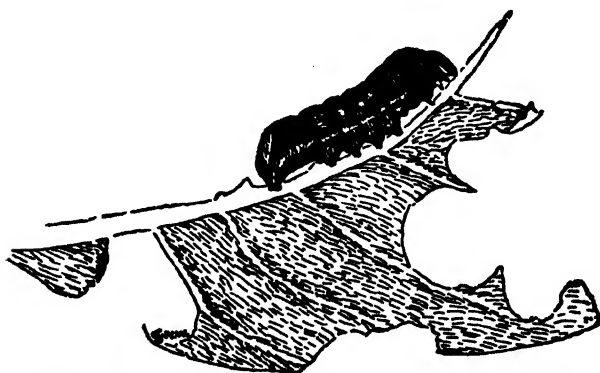
***Prodenia ornithogalli* Guenee**

(as *P. eudiopta* Guenee) Möschler. Gundlach.

Jones 15-8: on *Convolvulus*.

Wolcott 22c-13: larva attacking tobacco, illustration, known as "mantequilla" by tobacco-growers in Cuba.

EEP-94 & EEWI-558: "mantequilla" of tobacco; economic accounts.



Larva of *Prodenia ornithogalli* Guenee on tobacco leaf.
Natural size. (Drawn by G. N. Wolcott.)

at light at Guánica (665-13 det. F. E. Watson); larvae on eggplant (85-163), on rose (812-16), on fruit of tomato and pepper (543-16, 47-18); on tobacco at Cayey and Hatillo (67-23), at Yauco (355-23), called "casimir" by the farmers.

Prodenia latifascia Walker

(as *P. androgea* Cramer) Stahl. Möschler. Gundlach, "La oruga vive durante el día al pie de una planta tierna y de noche sale de la tierra a comer. Hace mucho daño en las huertas y otras tierras cultivadas, pues troncha los renuevos. Come de muy diferentes plantas."

Van Z. (912) on tomato.

EEP-94 & EEWI-558: as a pest of tobacco.

(as sp.) Wolcott 25-52: weight of tobacco leaves eaten by larva (I No. 864); (unlabeled specimens—det. W. Schaus); larva on tobacco at Caguas (166-21).

Prodenia rubrifusca Hampson—det. W. Schaus

at light at Bayamón.

Prodenia testaceoides Guenee

Möschler. Gundlach.

Xylomiges eridania Cramer

(as *Callierges*) Stahl. Möschler. Gundlach, "La oruga en *Amaranthus* y en *Solanum torvum*."

Jones 15-8: on *Amaranthus* sp.

(as *X. sunia* Guenee) Cotton 18-313: on tomato.

EEP-94: a pest of tobacco.

Wolcott 24-8, 31: economic status, eaten by *Anolis cristatellus*. at light at Bayamón (I No. 3529, 3741), at Guánica (618-13); larvae on *Amaranthus spinosus* (177-11 det. H. G. Dyar), and also on *Solanum torvum* (52-12, 318-16, 349-16, 356-16, 602-16), on mulberry (117-23 det. W. Schaus); on *Amaranthus* at Guánica (505-13); on tomato (174-16, I. No. 1950 Leonard 38-128), at Ponce (I No. 3232); on potato at Cidra (I No. 1853-B Leonard 33-123); on pepper at Loíza (I No. 1971); on Swiss chard at Bayamón (I No. 5281-C).

Xylomiges sunia Guenee

(as *Callierges*) Möschler. Gundlach, "La oruga se cría en *Gossypium*."

Van Z. (P. R. 1443).

Cotton 18-287: as a pest of chard and other vegetables, description of stages, life history and control.

Wolcott 24-26, 31: eaten by *Anolis stratulus* and *A. cristatellus*.

Torres 29-241: attacking Irish potatoes.

at light at Guánica (618-13 det. H. G. Dyar); larvae attacking alfalfa at Fajardo (387-13 det. H. G. Dyar); on Swiss chard (552-17, 588-17, 632-17), on green peas (552-17), on celery (595-17, 618-17), on asparagus (68-19); on Irish potatoes at Coamo (1-29); on tobacco at Yauco (354-23); pupa (199-12).

Galgula partita Guenee

Möschler. Gundlach.

Monodes agrotina Guenee—det. W. Schaus (as **Elaphria**)
at light (I No. 2780, 4596, 4997), at Bayamón (I. No. 2364
Leonard 33-131, 2763, 2770, 3100, 3533, 4726).

Monodes arna Möschler nec. Guenee
(as *Hadena*) Möschler. Gundlach.
(and as *Hadena chalcidonia* Hübner) Möschler. Gundlach.
at light at Guánica (635-13 det. W. Schaus).

Monodes deltoides Möschler
Möschler. Gundlach.
at light at Bayamón (I No. 4882).

Monodes nucicolora Guenee
Möschler. Gundlach.
at light (I No. 2783, 3329), at Guánica (684-13 det. F. E.
Watson).

Monodes (Hadena) ligata Möschler 89-130: TYPE from P. R.
Gundlach.

Monodes (Caradina) promiscua Möschler 89-142: TYPE from P. R.
(One unlabeled specimen—det W. Schaus.)

Monodes trapezoides Herrich-Schäffer—det. W. Schaus
at light (I No. 2781).

Elaphria subobliqua Walker—det. W. Schaus
at light at Utuado (W. A. Hoffman).

Bagisara subusta Hübner
(as *Atethmia inusta* Guenee) Stahl. Möschler. Gundlach.
at light (8-19), at Guánica (685-13 det. Watson and
Schaus); on "zalzilla", *Morongia leptoclada*, the probable host
of the larva. E. G. Smyth.

Caularis undulans Walker
(as *Eudryas bartholomaei* Boisduval) Möschler. Gundlach.
rare at light at Guánica (649-13 det. W. Schaus).

Cydosia submutata Walker
(as *C. nobilitella* Cramer) Dewitz 77-95. Stahl. Möschler
Gundlach.
Van Z. (P. R. 1439).
at light (755-16, I No. 4568), at Guánica (605-13 det. H. G.
Dyar); in cane field at Mameyes (800-12); resting on egg-
plant (280-16); "believed to feed on *Solanum* sp." E. G.
Smyth.

Eublemma cinnamomea Herr. Sch.
(as *Thalpochares*) Möschler. Gundlach.
at light at Bayamón (I No. 2754, 4206).

Eublemma obliqualis Fabr.
(as *Thalpochares pallescens* Herr. Sch.) Möschler. Gundlach.

Antiblemma concinnula Walker—det. W. Schaus
at light at Bayamón (I No. 3317).

Cobubatha quadrifera Zeller
(as *Thalpochares grapholithoides* Möschler 89-167, TYPE from
Porto Rico) Gundlach.

Ommatochila mundula Zeller
(as *Thalpochares*) Möschler. Gundlach.
at Mayagüez (I No. 4984).

Lithacodia apicosa Haworth
(as *Erastria nigrifolia* Guenee) Stahl.
(as *Erastria*) Möschler. Gundlach.

Amyna bullula Grote
(as *Mesostrotia imprinata* Möschler 89-163, TYPE from Porto
Rico) Gundlach.

Amyna octo Guenee
(as *Mesostrotia stigmatula* Snell) Möschler. Gundlach.
at light at Guánica (673-13 det. W. Schaus).

Xanthoptera aurifera Walker
(as *X. tripuncta* Möschler 89-158, TYPE from Porto Rico)
Gundlach.

Xanthoptera botyoides Guenee
Stahl. Möschler. Gundlach.
(I No. 2607, 2727).

Xanthoptera nigrofimbria Guenee—det. W. Schaus
at light at Bayamón (I No. 2859, 2932).

Anateinoma affabilis Möschler 89-167, fig. 14: TYPE from P. R.
Gundlach.

Heliocontia pantherulia Herr. Sch.
(as *Emmelia uncinula* Herr. Sch.) Stahl. Möschler. Gundlach.
(One unlabeled specimen—det. W. Schaus.)

Helicontia margana Fabr.
(as *Emmelia variegata* Möschler 89-156, TYPE from Porto Rico,
var. *ochracea* Möschler 89-156, TYPE of variety from Porto
Rico) Gundlach.
at light at Bayamón (I No. 2953); on "mabí" at Mayagüez
(I No. 4794).

Heliocontia perstructana Walker
(as *Emmelia felina* Herr. Sch. and as *E. trigidula* Herr. Sch.)
Stahl. Möschler. Gundlach.
at light at Bayamón (I No. 2645).

Spragueia dama Guenee
(as *Emmelia*) Möschler. Gundlach.
at light at Guánica (620-13 det. H. G. Dyar), at Bayamón
(I No. 2949).

Thalpochares albipectus Möschler 89-167: TYPE from P. R.
Gundlach.

Thalpochares basalis Möschler 89-169, TYPE from Porto Rico.
Gundlach.

Thalpochares putnami Möschler 89-168, TYPE from Porto Rico.
Gundlach.

Cecharismena cara Möschler 89-168, TYPE from Porto Rico.
Gundlach.

Cecharismena nectarea Möschler 89-165, TYPE from Porto Rico.
Gundlach.
at light at Bayamón (I No. 3157, 3338).

Krugia operta Möschler 89-164, TYPE from Porto Rico.
Gundlach.

Haplostola aphelioides Möschler 89-163, TYPE from Porto Rico.
Gundlach.

Metaponpneumata rogenhoferi Möschler 89-159, TYPE from Porto Rico.
Gundlach.

Erastria minima Herr. Sch.
Möschler. Gundlach.

Craeperia costalis Walker—det. W. Schaus.
(One unlabeled specimen.)

Tarachidia (Acontia) mixta Möschler 89-162, TYPE from Porto Rico.
(as *Acontia*) Gundlach.

Tarachidia semiflava Guenee—det. W. Schaus.
(One unlabeled specimen.)

Tarachira (Hadena) disgrega Möschler 89-128, TYPE from Porto Rico.
(as *Hadena*) Gundlach.
very abundant at light at Guánica (584-13, det. and generic transfer by W. Schaus).

Eutelia blandula Herr. Sch.
(as *Eurhipia*) Möschler. Gundlach.

Eutelia ablatrix Guenee
(as *Penicillaria*) Möschler. Gundlach.

Eutelia (Penicillaria) cuprea Möschler 89-179: TYPE from P. R.
(= *Parachabora abydas* H. S.) synonymy by W. Schaus.
(as *Penicillaria*) Gundlach.
at light (I No. 4567), at Guánica (674-13).

- Paectes arcigera** Guenee
(as *Ingura*) Stahl. Möschler. Gundlach.
at light (I No. 2779), at Bayamón (I No. 3450).
- Paectes devincta** Walker
(as *Ingura vittata* Möschler 89-171, TYPE from Porto Rico)
Gundlach, "Solamente conocida de Puerto Rico"
- Paectes obrotunda** Guenee
(as *Ingura elegans* Möschler 89-170, TYPE from Porto Rico)
Gundlach.
at light at Guánica (634-13 det. W. Schaus).
- Stictoptera penicillum** Herr. Shc.
Stahl. Möschler. Gundlach, "La oruga vive en *Parkinsonia aculeata* y en *Posppigia proiera*."
- Stictoptera vitrea** Guenee
Stahl. Möschler. Gundlach.
- Charcoma nilotica** Rogenh
(as *Paraxia chamaelon* Möschler 89-121, TYPE from Porto Rico)
Gundlach.
at light at Guánica (608-13 det. A. G. Dyar); larvae, semi-transparent greenish-white, feeding on buds and webbing together small leaves of "sauce", Humboldt's willow, at Aguadilla (23-22 det. W. Schaus).
- Leianophera transfossa** Möschler 89-136, fig. 16, TYPE from Porto Rico.
Gundlach.
- Casandria abseuzalis** Walker
(as *Pleurasympieza smithii* Möschler 89-147, fig. 18, TYPE from Porto Rico) Gundlach.
one adult at light at Guánica (610-13 det. H. G. Dyar).
- Casandria elota** Möschler 89-145 (as *Collomena*), TYPE from Porto Rico.
(as *Collomena*) Gundlach.
at light (I No. 5285).
- Iscadia aperta** Walker
(as *Encalypta schildei* Möschler 89-148, TYPE from Porto Rico)
Gundlach.
- Achaea ablunaris** Guenee
(as *Ophisma ablunaris* Guenee, var. *hilaris* Möschler 89-202, TYPE from Porto Rico) Gundlach. Stahl.
- Ophisma tropicalis** Guenee
Stahl. Möschler. Gundlach, "Oruga en *Cupania*."
- Mocis antillesia** Hampson—det. W. Schaus
at light (I No. 3109).

Mocis disseverans Walker—det. W. Schaus

(I No. 869, 870), at light at Bayamón (I No. 2307 Leonard 33-131, 2365).

Mocis marcida Guenee—det. W. Schaus.

A black spot nearly 1 mm. in diameter on inner margin of forewings, near base.

at light (196-11, 1016-16; larvae feeding on cowpeas (52-21), on velvet bean (158-23).

Mocis megas Guenee

The black spot very small or absent.

(as *Remigia*) Stahl. Möschler. Gundlach.

at light (54-17), at Bayamón (I No. 2601), at Mameyes (192-13 det. H. G. Dyar), at Guánica (563-13).

Mocis repanda Fabr.

(as *Remigia latipes* Guenee) Stahl.

(as *R. latipes* Guen. and as *R. repanda* Fabr., not in synonymy) Möschler. Gundlach.

(as *Remigia*) Van Z. (1507) on millet and grasses.

(as *Remigia*) Jones 13-230 to 236: with *Laphygma frugiperda* S. & A. attacking young sugar cane and malojillo grass, *Panicum barbinode*, at Río Piedras, Mameyes and Cayey, La Plata.

(as *Remigia*) Van Dine 13-257; Van Dine 13-31; Jones 14-463: as a pest of sugar cane larvae feeding on the leaves.

Smyth 19-144: on sugar cane and grasses.

Wolcott 21-38: larvae parasitized by *Euplectrus* sp. at Morovis.

Jones & Wolcott 22-49: the most complete account, description of all stages and parasites noted: *Phorocera clavigennis* Macq., *Linnaemyia fulvicauda* Walton, *Helicobia helcis* Towns., *Chalcis* near *robusta* Cress. (*C. robustella* Wole.) and *Rogas* sp. attacking the larvae, and *Sarcophaga sternodontis* Towns. reared from the pupa.

EEP-39, 44 & EEWI-208 to 211: a pest of sugar-cane and malojillo.

Wolcott 24-6 & 8, 20, 23, 26, 31: parasites of and economic status; eaten by *Anolis pulchellus*, *A. krugii*, *A. stratulus* and *A. cristatulus*.

Dozier 26-116: attacking young cane and malojillo, October-November, 1924.

Wolcott 24-98: outbreak in the fall and winter of 1923.

Wolcott 25-52: weight of leaves eaten by larva.

Menéndez Ramos, R.. "Como hemos combatido el Gusano Agrimensor de la Caña en Humacao". Rev. Agr. P. R., Vol. 16, No. 1, pp. 9-11. San Juan, 1926.

Molinary Sales, E.. "Extirpación del Gusano Agrimensor (*Mocis remigia repanda*) que ataca las Hojas de la Caña". Rev. Agr. P. R., Vol. 13, No. 6, pp. 385-387. San Juan, 1924.

at light (1124-16, 82-19, 90-21), at Bayamón (I No. 2641, 2863, 3321, 3527), at Guánica—very common—(606-13);

pupa in *Ipomoea* leaf (148-12); larvae on sugar cane (24-12), at Mameyes (811-12, 841-12), at Guayama (202-12), at Santa Isabel (209-11), at Fortuna (31-12), at Guánica (659-14, 24-15), at Barceloneta (E. D. Colón, Nov. 1922), at Caguas (160-32); on malojillo grass, *Panicum barbinode*, (24-12), at Arecibo (160-19); in pasture at Cabo Rojo (437-21); on elephant grass malojillo and young cane at Aguadilla (142-31 Leonard 33-126); on guinea grass at Yauco (356-23), at Boquerón (340-23).

Phurys immunis Guenee

Stahl. Möschler. Gundlach.

(One unlabeled specimen—det. W. Schaus.)

Phurys helvina Guenee

Stahl. (as *P. helvica* Herr. Sch.) Möschler. Gundlach.

Nymbis garnoti Guenee

(as *Phurys*) Stahl. Möschler. Gundlach.

Safia acharia Cramer

(as *Yrias*) Möschler. Gundlach.

Zale exhausta Guenee

(as *Homoptera*) Möschler. Gundlach.

Zale fctilis Guenee

(as *Homoptera*) Möschler, Gundlach.

at light (944-16 det. W. Schaus).

Zale lunata Drury

(as *Homoptera*) Möschler. Gundlach.

at light at Bayamón (I No. 2766).

Zale obsita Guenee

(as *Homoptera*) Stahl.

Zale setipes Guenee

(as *Xylis*) Stahl. Möschler. Gundlach.

Zale terrosa Guenee—det. W. Schaus.

at light (944-16).

Decalea infusa Walker

Möschler. Gundlach.

Syngrapha egena Guenee—det. W. Schaus

larva on shade tobacco at Cayey (7-23); on lima beans at Cidra (I No. 1903 Leonard 33-135).

Syngrapha egenella Herr. Sch.

(as *Plusia*) Möschler. Gundlach.

Phytometra admonens Walker—det. W. Schaus

at light at Bayamón (I No. 2945).

Phytometra calceolaris Walker

(as *Plusia*) Möschler. Gundlach, "La oruga en *Commelina*".

Phytometra illustrata Guenee—det. W. Schaus

at light (I No. 2778).

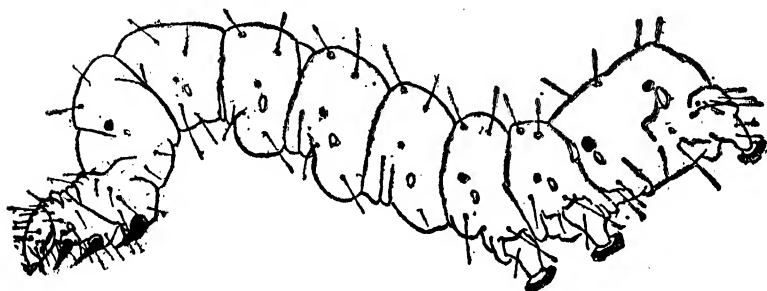
Phytometra ni Hübner

at light at Guánica (650-13 det. W. Schaus).

Phytomera oo Cramer

(as *Plusia binotula* Herr. Sch.) Stahl.

(as *Plusia rogationis* Guenee) Stahl. Möschler. Gundlach. Cotton 18-311: as a pest on tomato, notes and control. Wolcott



Phytometra oo Cramer, larva.

Five times natural size.

(Drawn by G. N. Wolcott.)

22c-14: a pest on tobacco and tomato, notes and control, "el Agrimensor Verde".

EEP-94: as a pest of tobacco.

EEWI-565: on shade tobacco and on tobacco in curing sheds. at light (937-16, 582-17), at Bayamón (I No. 5029), at Vega Baja (497-16), at Utuado (WAH), at Guánica (681-13); larvae on tomato (175-16, 1-16, 117-22), at Isabela (176-31); on tobacco at Cayey (327-17); on beans (608-17), on sweet potatoes (122-17), on cabbage (i-27), on lima beans (I No. 1766).

Phytometra verruca Fabr.

(as *Plusia*) Möschler. Gundlach.

larvae on purslane (149-12), on *Hyptis capitata* (363-16 det. W. Schaus, 315-16, 987-16); adults at light (I No. 2777), at Bayamón (I No. 2498, 3174, 3750).

QUADRIFINÆ

Erebus odora Linn.

Stahl. Möschler. Gundlach, "La oruga se alimenta de varias especies de *Cassia*, de *Pithecolobium*, etc., ocultándose durante el día entre las grietas de la corteza". Van Z. (1418) on *Cassia fistula*, *Pithecolobium saman* and *Ficus* sp.

adults found in the laboratory in the morning (747-13, 981-13, 570-16, 539-19).

Letis atricolor Guenee

Möschler. Gundlach.

Letis mycerina Fabr.—det W. Schaus.

Wolcott 23-57: larva feeding on leaves of coffee.

at light at Bayamón (I No. 2900); in coffee grove at Adjuntas (486-21, 283-22), flying about in the dusk, snapping their wings together occasionally or struggling to copulate on the ground, at Ciales (462-21); larvae on coffee at Lares (425-21).

Latebraria amphipyroides Guenee

Möschler. Gundlach, "Oruga en especies de *Cassia*".

Peosina numeria Drury

Stahl. Möschler. Gundlach.

Brujas rengus Poey

Möschler. Gundlach.

Concana mundissima Walker

(as *Theliodora splendens* Möschler.) Möschler. Gundlach.

Eulepidotis addens Walker—det. H. G. Dyar

a small green leaf-folding caterpillar on *Inga vera* at Cayey (36-21); adults at light at Bayamón (I No. 2882, 2919), at Mayagüez (I No. 4985).

Eulepidotis hebe Möschler (as **Palinda**) 89-195, TYPE from Porto Rico.

(as *Palinda*) Gundlach.

at light at Bayamón (I No. 3159, 4411).

Eulepidotis inferior Herr. Sch.

Stahl.

Eulepidotis mabis Guenee

(as *Palinda*) Möschler. Gundlach.

Eulepidotis modestula Herr. Sch.

(as *Palinda*) Möschler. Gundlach. Van Z. (P. R. 1406).

(defoliating ceiba trees in Haiti—Smith & Audant 30-977).

common at light at Bayamón (I No. 3500), at Guánica (625-13 det. H. G. Dyar).

Eulepidotis rectimargo Guenee

Stahl.

Eulepidotis striaepuncta Herr. Sch.

(as *Palinda variabilis* Möschler, var. *obscura* Möschler 89-195, TYPE of variety from Porto Rico) Gundlach.

Eulepidotis superior Guenee

(as *Palinda dewitzii* Möschler 89-196, TYPE from Porto Rico)

(as *Palinda*) Gundlach.

Dyomyx juno Möschler 89-197, TYPE from Porto Rico.

Gundlach.

Noropsis hieroglyphica Cramer

(as *Euglyphia fastuosa* Guenee) Stahl.

(as *N. fastuosa* Guenee) Möschler. Gundlach, "Oruga en *Corchorus*."

Van Z. (P. R. 1421). Van Zwaluwenburg 18-33: on *Waltheria americana* and *Morongia leptoclada*. "The larvae are more or less gregarious and drop to the ground when distributed. The full grown larva is about 25 mm. long and about 4 mm. across the head. The ground color of the body is bluish or greenish white with a black stripe running around the body on each segment. The segments are divided from one another by a narrow black line. The anal plate and head are reddish-brown, the collar shiny black. The oval pupa case, about 22 × 10 mm. is formed of parchment-like material on the stem of the food plant and is covered with grass and bits of leaves."

at light (612-12), at Coamo (I No. 4590), very abundant at Guánica (550-13); reared from cocoon (162-12), very abundant on fence posts in cane fields at Yauco (330-21); larvae on *Waltheria americana* at Boquerón (16-23); boring into trunks of young casuarina trees to pupate at Guánica (295-23).

Pseudohemiceras krugii Möschler 89-176, TYPE from Porto Rico. Gundlach.

at light at Guánica (564-13 det. Dyar); larvae boring in twigs of roble, *Tecoma pentaphylla* (831-16).

Hemicephalis characteria Cramer

Möschler. Gundlach.

Melipotis acontoides Guenee = **sinualis** Harvey—det. F. E. Watson at light at Guánica (1058-13); caterpillars on flamboyán at Manatí (I No. 6021), a serious outbreak, defoliating many trees between the Condado and Hato Rey, reported by F. Sein in an article in "El Mundo" of San Juan, August 1933 (52-33).

Melipotis contorta Guenee

(as *Bolina striolaris* Herr. Sch.) Stahl. Möschler.

(as *Bolina*) Gundlach.

Melipotis fasciolaris Hübner

(as *Bolina*) Möschler. Gundlach.

(I No. 2728), at light at Guánica (677-13 det. W. Schaus).

Melipotis januaris Guenee

(as *Bolina* and as *B. russaris* Guenee, not in synonymy) Möschler. Gundlach, "Esta especie varía mucho, v. g. var. *limitata*, var. *bimaculata*, var. *confusa* Möschler".

Van Zwaluwenburg 18-34: Thousands of the larvae on guamá, *Inga laurina*, at Mayagüez in June, 1917; pupated in the ground.

in June (I No. 2556); adults at light (I No. 2536, 2537 Leonard 33-135, 4595, 4569), at Bayamón (I No. 3449).

Melipotis leucomelana Herr. Sch.

(as *Bolina*) Möschler. Gundlach.

Melipotis nigrescens Grote & Robinson. var. **ochreipennis** Harvey

(as *Bolina*) Möschler. Gundlach.

Melipotis ochrodes Guenee

(as *M. manipularis* Guenee) Van Z. (P. R. 1435).

common at light at Guánica (582-13 det. Dyar, 1060-13); pupa in crevice in leguminous tree at Fajardo (21-15); larvae in hole nearly covered with bark in leguminous tree at Central Mercedita (74-22); larvae in crevices in bark of algarroba trees (*Prosopis juliflora*, *P. glandulosa* and *P. pubescens*) or under trash at the base of trees at Guánica (412-14, 426-14, 452-14, 499-14); feeding on zalzilla at Yauco (353-23).

Melipotis rectifasciata Herr. Sch.

(as *Bolina*) Möschler. Gundlach.

Epidromia pannosa Guenee

(as *E. rotundata* Herr. Sch.) Stahl.

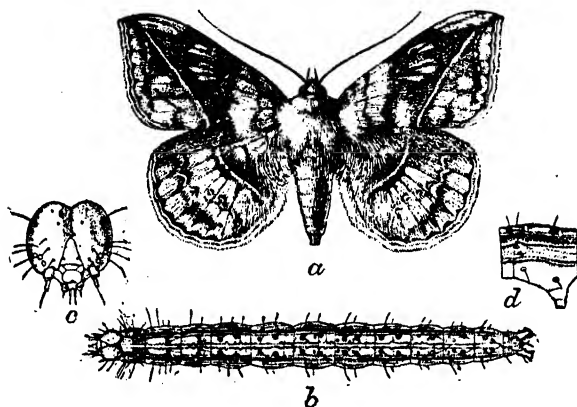
Möschler. Gundlach.

at light at Bayamón (I No. 2769).

Thermesia gemmatilis Hübner

Stahl. Möschler. Gundlach.

(as *Anticarsia*) Cotton 18-293: larva destructive to velvet beans and cowpeas, notes and control.



Thermesia gemmatilis Hübner: a, adult, b, larva from above, c, head of larva, d, one segment of larva, from the side. (After Chittenden.)

EEP-116: on cowpeas.

at light (832-16, 319-23), at Bayamón (I No. 2920), at Vega Baja (I No. 3529), at Guánica (660-13); larvae on *Phaseolus max* (866-14, 876-14), on foliage of gallito trees, *Agati grandiflora* (974-16); abundant on cowpas at Loíza (I No. 4350); on alfalfa at Isabela (141-31); on peanut (158-22).

Thermesia elegantula Herr. Sch.

Möschler. Gundlach, "Es probable que ésta y la especie precedente sean iguales." "A form of the preceding." Schaus.

Pangrapta repugnalis Hübner

(as *Azeta*) Stahl. Möschler. Gundlach.

Bendis formularis Hübner

(as *B. impar* Guenee) Stahl.

Möschler. Gundlach, "La oruga se cría en *Cassia obtusifolia*. at light (52-17), at Bayamón (I No. 3496), at Guánica (1065-13 det. W. Schaus); larva on *Mimosa* sp. (512-23).

Bendis magdalia Guenee

Möschler. Gundlach.

Aluaca flavicapilla Möschler (as *Diastema*) 89-162, TYPE from Porto Rico.

(as *Diastema*) Gundlach.

larvae on *Agati grandiflora* (205-12 det. H. G. Dyar as *A. agilaria* Druce); adults at light at Bayamón (I No. 3337).

Yrias progenies Guenee

Möschler. Gundlach. Van Z. (P. R. 1408).

at light at Guánica (603-13 det. H. G. Dyar).

(Celaeno amoides Herr. Sch.

Stahl.)

Toxonprucha diffundens Walker

(as *T. amoena* Möschler 89-198, fig. 1, TYPE from Porto Rico)

Gundlach.

Capnodes anhypha Guenee

Möschler. Gundlach.

Capnodes astyla Möschler 89-215, TYPE from Porto Rico.

Gundlach.

Capnodes priscilla Möschler 89-216, TYPE from Porto Rico.

Gundlach.

Capnodes prisca Möschler 89-216, TYPE from Porto Rico.

Gundlach.

Capnodes sterope Cramer

Möschler. Gundlach.

Capnodes turtur Felder & Rogenhf., var. *insularis* Möschler 89-215,

TYPE of variety from Porto Rico.

Gundlach.

Selenis portoricensis Möschler 89-214, TYPE from Porto Rico.

Gundlach.

larva on *Aeschynomene sensitiva* (882-14 det. W. Schaus).

Selenis suero Cramer

(as *S. sueroides* Guenee) Stahl.

Möschler. Gundlach.

(One unlabeled specimen—det. W. Schaus.)

Orodesmia apicina Herr. Sch.

Stahl.

Baniana significans Walker

Möschler. Gundlach.

at light at Guánica (1067-13 det. W. Schaus).

Focilla angularis Möschler

Möschler. Gundlach.

Ephyrodes cacata Guenee

Möschler. Gundlach.

Syllectra congemmalis Hübner

(as *S. fctillina* Möschler) Möschler. Gundlach.

Syllectra ericata Cramer

Möschler. Gundlach.

(One unlabeled specimen—det. H. G. Dyar), at light at Bayamón (I No. 3316).

Syllectra lucifer Möschler 89-210, TYPE from Porto Rico. Gundlach.

Alabama argillacea Hübner

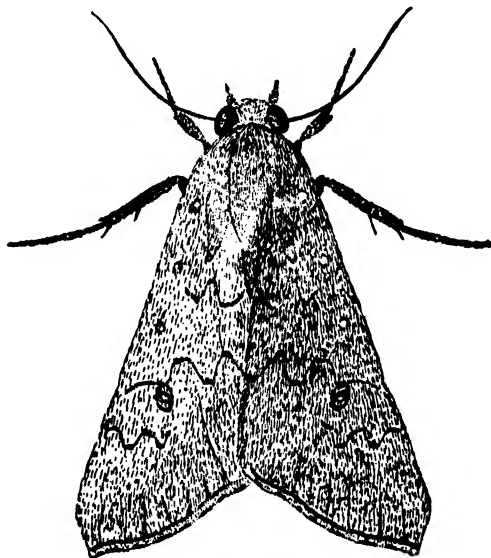
(as *Anomis*) Stahl. Möschler. Gundlach.

Van Z. (1401) on cotton.

Wetmore 16-119: eaten by Mozambique.

Barrett 06-23: "destructive in small areas (in 1905) throughout a large cotton plantation (near Aguadilla)---the pupae nearly all parasitized by *Chalcis annulata* Fabr."

May 06-11: "caused serious injury in a great many fields."



Alabama argillacea Hübner. Three times natural size. (Drawn by F. Maximilien.)

Smyth 20-122: an outbreak in the Hatillo district during July 1919.

Wolcott 23-59: not observed in 1921.

EEP-18 & 62 to 64: parasites of; an economic account.

Wolcott 24-6: parasites of.

Wolcott 24-56: an outbreak at Hatillo, summer of 1922.

Tower 24-13: outbreak at Cabo Rojo, December 1922.

Wolcott 24-97: outbreak at Boquerón, fall of 1923.

Wolcott 25-52: weight of leaves eaten by larva.

Catoni, L. A., "Insectos que atacan al Algodón". Rev. Agr. P. R., Vol. 6, No. 3, pp. 25-31. San Juan, 1921.

Hernández, Elías & Ramírez López, C., "Represión de la Oruga de la Hoja del Algodón". Rev. Agr. P. R., Vol. 14, No. 1, pp. 43-44. San Juan, 1925: arsenate of lead dust gave best results.

Wolcott, G. N., "The Mystery of *Alabama argillacea*". Amer. Naturalist, Vol. 63, No. 684, pp. 82-87. New York, Jan.-Feb., 1929: "in the scattered cotton fields in limited areas in Porto Rico, *Alabama* sometimes appears in destructive abundance, but in other years is not to be seen."

Riollano 31-104: not in Vieques Id. in 1930.

Leonard 31-114, 119 and 32-130: destructive outbreaks.

Pastor Rodríguez 33-27: economic notes.

EEWI-277 to 284: "In Porto Rico, which has two cotton sections, with seasons at the opposite period of the year, it may persist for several years continuously. and again be entirely absent for a series of years."

adults at light at Isabela (140-31): larvae on cotton in large numbers at Hatillo in July (510-19), at Vega Baja in June (207-22), at Hatillo in August (206-22), very abundant in September in a few fields, had disappeared in October (329-22), at about the same time at Boquerón, a few parasitized pupae being found in January (23-23); at Vega Baja in July (251-23), in June at Hatillo (245-23) and at Garrochales (245-23); on cotton in two months after the hurricane of San Ciprián (157-32). The small larvae are killed by *Apanteles aletiae* Riley, the pupae by *Chalcis incerta* Cresson and *Sarcophaga sternodontis* Towns.

Anomis doctorium Dyar

(as *Alabama argillacea* Hübner on *Urena lobata*) Smyth 20-122: recommends the destruction of *Urena lobata* to eliminate the alternate host of the cotton caterpillar, but the moths he reared prove to be *Anomis doctorium* Dyar (694-16).

Wolcott 23-59: larvae on cotton.

larvae on cotton at Humacao (435-21), at Guayama (515-22), at Villalba (553-21), at Guánica (335-21, 434-21), at Camuy (226-21 det. H. G. Dyar), at Manatí (555-21), at Vega Baja and Garrochales (332-22); on *Urena lobata* (694-16); (on *Malachra rotundifolia* (969-16), no specimen in the collection and identification doubtful).

Anomis editrix Guenee

Stahl. Möschler. Gundlach, "La oruga se cría en *Triumfetta*". larvae on *Triumfetta* sp. (800-16 det. F. E. Watson).

- Anomis erosa** Hübner—det. W. Schaus
at light at Bayamón (I No. 5128.)
- Anomis fulvida** Guenee
Stahl. Möschler. Gundlach.
- Anomis illita** Guenee = **A. exata** Hübner—synonymy by H. G. Dyar.
Möschler. Gundlach.
at light (I No. 2771), at Bayamón (I No. 2858, 3046), at Mayagüez (I No. 4334).
- Anomis praeurupta** Möschler 89-173, TYPE from Porto Rico.
Gundlach, "No está indicada de otras tierras".
- Cosmophila erosa** Hübner
Stahl. Möschler. Gundlach, "La oruga se cría en *Plumbago*, también en las *Althaea*".
resting on cotton at Sabana Grande (504-22), at light at Guánica (1084-13 determined by F. E. Watson and by W. Schaus), at Bayamón (I No. 2861, 3160, 3366).
- Plusidonta thomae** Guenee
Möschler. Gundlach.
- Oraesia aequalis** Walker
Möschler. Gundlach.
- Oraesia excitans** Walker—det. W. Schaus
at light at Bayamón (I No. 3368).
- Oraesia metallescens** Guenee
Möschler. Gundlach.
- Pseudocalpe tristriga** Herr. Sch.
Möschler. Gundlach.
- Athysania bidens** Hübner—det. W. Schaus
at light at Bayamón (I No. 4045).
- Athysania incurva** Sepp—det. W. Schaus
at light at Bayamón (I No. 3102, 4410, 5127).
- Gonodonta hesione** Drury
Möschler. Gundlach.
at light at Bayamón (I No. 2899, 3101, 5259).
- Gonodonta latimacula** Guenee
Möschler. Gundlach, "Oruga en *Artanthe* y *Potomorphe*".
- Gonodonta maria** Guenee
Stahl. Möschler. Gundlach, "Oruga en *Anona glabra* y *palustris*, *Bocagea virgata*, *Nectandra*".
- Gonodonta nitidimacula** Guenee—det. H. B. Dyar
IP-176: larva feeding on leaves of unidentified tree (165-21, 174-21), on *Piper medium* (176-21), at Cayey (384-22).
Larva and adult described.

Gonodonta soror Cramer
Stahl. Möschler. Gundlach.

Gonodonta uxor Cramer
Stahl.

Gonodonta teretimacla Guenee
Stahl. Möschler. Gundlach, "La oruga come *Artanthe*".

Calpe excitans Walker—det. W. Schaus
at light at Bayamón (I No. 2733, 2855, 2856, 4043).

Ophideres gubernatrix Guenee
Möschler. Gundlach.

Cocytodes schneideriana Cramer—det. W. Schaus.
at light (209-16).

HYPENINÆ

Phiprosopus albigitta Herrich-Schäffer—det. W. Schaus.
IP-177: description of adult, cocoon and larva, the latter abundant on ? at Boquerón (110-23).

Rivula pusilla Möschler 89-234, TYPE from Porto Rico.
Gundlach.
at light at Bayamón (I No. 2793).

Lophoditta tuberculata Herr. Sch.
(as *L. perspicillaris* Möschler 89-231, TYPE from Porto Rico).
Gundlach.

Mastigophorus dimissalis Möschler 89-233, TYPE from Porto Rico.
Gundlach.

Physala peckii Möschler 89-232, TYPE from Porto Rico.
Gundlach.

Phlyctaina irrigualis Möschler 89-229, TYPE from Porto Rico.
Gundlach.

Tetanolita mutatalis Möschler (as *Scelescepon*) 89-230, TYPE from Porto Rico.
(as *Scelescepon*) Gundlach.

(One unlabeled specimen—det. W. Schaus), at light at Bayamón (I No. 3743, 3927, 4213).

Zagorista debora Druce—det. W. Schaus.
larvae on leaves of *Caperonia palustris* (379-16, 886-16).

Lophophora clanymoides Möschler 89-228: TYPE from P. R.
Gundlach.
at light at Bayamón (I No. 3536, 3925, 4212).

Epitomiptera pterophalis Guenee—det. W. Schaus
at light at Utuado (W. A. Hoffman).

Epitomiptera orneodalis Guenee—det. W. Schaus
larvae feeding on leaf of papaya at Isabela (I No. 1999-B
Leonard 33-121).

Tortricodes orneodalis Guenee—det. W. Schaus.
at light at Guánica (679-13); larva on tomato (173-16).

Bleptina acastusalis Walker
(as *Anagoa nigromaculalis* Möschler 89-218, and *A. placidalis*
Möschler 89-218, TYPE from Porto Rico) Gundlach.

Bleptina caradrinalis Guenee
(as *B. subjecta* Möschler 89-226, TYPE from Porto Rico) Gundlach.

Bleptina menalcasalis Walker
(as *Anagoa limatalis* Möschler 89-218, TYPE from Porto Rico)
Gundlach.

Aglaonice hirtipalpis Walker
(as *A. snelleni* Möschler 89-227, TYPE from Porto Rico) Gundlach.

Sisputa gracilis Möschler 89-222, TYPE from Porto Rico.
Gundlach.
at light at Bayamón (I No. 2921, 3458).

Hormoschista orba Grote
(as *H. pagenstecheri* Möschler 89-221, TYPE from Porto Rico)
Gundlach.

Bomolocha exoletalis Guenee
(as *Hypena*) Möschler. Gundlach.

Bomolocha umbralis Smith
(as *Hypena cervicalis* Möschler 89-223, TYPE from Porto Rico)
Gundlach.
at light at Bayamón (I No. 3339).

Bomolocha conditalis Möschler (as **Hypena**) 89-222, TYPE from
Porto Rico.
(as *Hypena*) Gundlach.
"probably the same as *vetustalis* Guenee." W. Schaus.

Anepischetos degesalis Walker
(as *Hypena vincularis* Möschler 89-224, TYPE from Porto Rico)
Gundlach.

Anepischetos lividalis Hübner
(as *Hypena*) Möschler. Gundlach.

Anepischetos porrectalis Fabr.
(as *Hypena incertalis* Möschler 89-225, TYPE from Porto Rico)
Gundlach.
at light at Bayamón (I No. 3340).

Carteris oculatalis Möschler (as **Zanclognatha**) 89-225, TYPE from Porto Rico.
(as *Zanclognatha*) Gundlach.

Metalla variabilis Möschler 89-220, TYPE from Porto Rico.
Gundlach.

NOTODONTIDÆ

Nystalea ebalea Cramer
Möschler. Gundlach, "La oruga vive en *Comocladia* y en *Spondias*."
Forbes 30-45: at Coamo Springs.
(53-25), at light (I No. 3040).

Nystalea nyseus Cramer
(as *Cyrrhaesta*) Dewitz. Stahl.
Möschler. Gundlach. Forbes 30-45.

Proelymiotis aequipars Walker
(as *Nystalca divisa* Möschler). Gundlach.
Forbes 30-46.

Edema insularis Grote
Dewitz. Möschler. Gundlach, "La oruga se cría en *Cupania*."
(as *Hippia*) Forbes 30-46.

Rifargia distinguenda Walker
(as *Symmerista dubia* Möschler) Möschler. Gundlach.
Forbes 30-46.

SPHINGIDÆ

Rothschild W. & Jordan, K. "A Revision of the Lepidopterous Family Sphingidae." *Novitates Zool.* 9, Suppl., pp. 972, pl. 67. 1903.

Determinations of Sphingidae in the Insular Station collection are by Mr. B. Preston Clark, or by the individual collectors, confirmed by Mr. Clark.

Herse cingulata Fabr.
(as *Sphinx*) Dewitz. Möschler. Gundlach.
(as *Macrosila*) Stahl.
(as *Phlegethontius convoluti* Linn.) Jones 15-7: on sweet-potato. Van Z. (918) on sweet-potato.
EEP-125 and EEWI-642: the outbreak of 1910.
Forbes 30-50: at Mayagüez. Forbes 31-344: on Vieques Id. adults at light (I No. 1169, 224-12, 120-21), at Bayamón (I No. 3173); larvae present in enormous abundance on sweet-potato along north-west coast of Porto Rico, between Arecibo and Aguadilla (110-December, 1918), many parasitized by Tachinid flies, *Belvosia bifasciata* Fabr. "Farmers at Hatillo say that about December 10th the larvae were seen by millions,

and that after devouring all sweet-potato vines in one field they migrated to another in hordes, crawling over one another 'in streams like ants.'" E. G. Smyth.

Cocytius antaeus antaeus Drury

(as *Amphonyx*) Dewitz. Stahl. Möschler. Gundlach, "La oruga se cria en *Anona muricata*."

Forbes 30-52. Forbes 31-344: at Hato Rey.

at light (147-12, 779-14, 571-16, 50-19), at Bayamón (I No. 4673), at Guánica (494-14); parasitized larva on *Annona* (43-19).

Cocytius cluentius Cramer

(as *Amphonyx*) Dewitz. Stahl. Möschler. Gundlach.

Forbes 30-51.

(one unlabeled specimen.)

Phlegethontius brontes Drury, var. *smythi* Clark. B. P., (as **Protoparce**) Proc. New England Zoological Club, Vol. 4, p. 100, pl.

x, fig. 1, March 21, 1919, TYPE of variety from Porto Rico.

(as *Sphinx brontes* Dr.) Dewitz. Möschler. Gundlach.

(as *Macrosila*) Stahl.

Forbes 30-54. Forbes 31-344: at Coamo Springs and San Germán.

at light (719-16 TYPE of variety, 1006-16), at Bayamón (I No. 3325).

Phlegethontius rusticus rusticus Fabricius

(as *Sphinx*) Dewitz. Möschler. Gundlach, "La oruga vive en *Sesamum* y en *Tecoma stans*."

(as *Macrosila*) Stahl.

Van Z. (P. R. 1431). Forbes 30-53.

at light (351-16).



Phlegethontius jamaicensis Butler: egg and larvae. Less than natural size. (Drawn by G. N. Wolcott.)

Phlegethontius sextus Johansson var. **jamaicensis** Butler

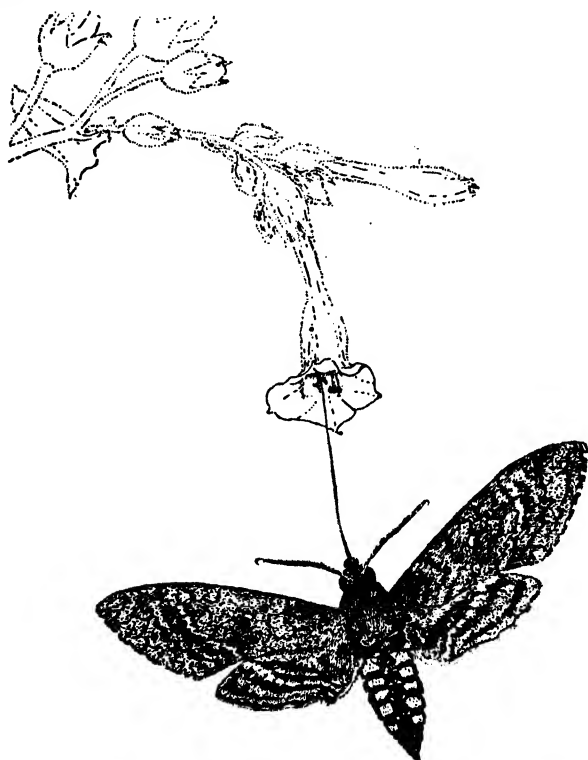
(as *Macrosila carolina* Linn.) Dewitz. Stahl.

(as *Sphirix carolina* Linn.) Möschler. Gundlach, "Muy dañina al cultivo del tabaco, y en las huertas al tomate (*Lycopersicum*)."

(as *P. carolina* Linn.) Busck 00-89: on tobacco.

(as *P. carolina* Linn.) Barrett 03-448: economic notes.

Tower 08-36: eggs parasitized by *Telenomus monilicornis* Ashmead.



Phlegethontius jamaicensis Butler, Less than natural size.

(Drawn by F. Sehn.)

(as *Protoparce*) Van Z. (1101) on tobacco and tomato.

(as *Protoparce*) Jones 15-7: notes.

(as *Protoparce*) Cotton 18-310: notes.

(as *Protoparce*) Wolcott 22c.-5: life history and control, illustrations of all stages and larva in beak of mozambique, *Holoquiscalus brachypterus*.

EEP-86 to 89 & EEWI-565 to 570: economic, illustrated accounts.

Wolcott 24-10: larvae fed to *Ameiva exsul* in captivity.
Wolcott 25-47 to 51: adults weigh (dry) about one-tenth as much as the weight of the food of the larvae (dry), half of the loss being in transformation from larva to adult.

Rosenfeld. A. H., "The Food of Porto Rican Lizards." Jour. Ec. Ent., Vol. 18, No. 2, pp. 422-423. Geneva, N. Y., April 1925: adult attacked by *Anolis cristatellus*.

Leonard 31-116 & 32-140: on tobacco.

AMC: at Luquillo vii-32, Mayagüez x-30, xi-30.

adult at light (I No. 2722) at Bayamón (I No. 3492); larvae on tomato (866-16); on *Solanum torvum* (181-12, 971-16), at Guánica (549-13); on tobacco at Aibonito (788-15), at Bayamón (16-19), at Manatí (I No. 1003), at Arecibo (231-19), at Mayagüez (39-19).

(*Ceratomia amyntor* Geyer
Van Z. (P. R. 1432).)

(*Ceratomia catalpae* Boisduval
AMC: at Mayagüez iv-27, xii-28.)

***Protambulyx strigilis* Linn.**

(as *Ambulyx* Dewitz. Stahl. Möschler. Gundlach, "La oruga vive en *Comocladia* y también en *Erythroxylon*".

Forbes 20-54. Forbes 31-344: at Coamo Springs.

at light, July and August (434-16, 559-16, 784-16, 817-16); larvae (? of this species) on *Annona muricata* (21-19, 112-19).

***Pseudosphinx tetrio* Linn.**

Dewitz. Stahl. Möschler. Gundlach, "Oruga en *Plumiera*". Busck 00-90: on *Plumiera rubra*.

Van Z. (1638) on *Plumiera*. Forbes 30-55.

(264-16); larvae on *Plumiera alba* (134-20), very abundant at Ballena, on the coast by Guánica (725-15, 810-15), on Mona Id. (I No. 2158 Leonard 33-135).

***Erinnyis alope* Drury**

(as *Anceryx*) Dewitz.

(as *Dilophonota*) Stahl. Möschler. Gundlach, "La oruga se cría en *Carica papaya*".

Van Z. (P. R. 1430). EEP-75: on papaya. Forbes 30-57.

at light (436-16, 1013-16, I No. 2724); larvae on host (45-16, 985-16, 122-21).

***Erinnyis ello* Linn.**

(as *Anceryx*) Dewitz.

(as *Dilophonota*) Stahl. Möschler. Gundlach, "La oruga se cría en *Jatropha manihot*". Notes on *Microgaster flaviventris* Cresson at a parasite of the larva.

Van Z. (1233) on *Carica papaya*.

Forbes 30-50: at Ponce and Coamo Springs.

Forbes 31-344: on Vieques Id.

at light (780-12, 1220-13, 321-16, 785-16), at Bayamón (I No. 3315); larvae on *Chamaesyce hyssopifolia* (781-14, 872-14, 1014-16); larvae on *Manihot utilisima* at Aguadilla (129-18).

Erinnyis crameri Schaus

Forbes 30-59: at Ponce.

AMC: at Coamo Springs xi-30.

at light (741-16), at Bayamón (I No. 5723).

Erinnyis domingonis Butler

Forbes 30-60.

at light (423-17).

Erinnyis lassauxi Boisduval form *merianae* Grote

(as *Anceryx*) Dewitz.

(as *Dilophonota*) Möschler. Gundlach, "La oruga se cría en *Carica papaya*".

Forbes 30-57.

Erinnyis oenotrus Cramer

(as *Anceryx*) Dewitz.

(as *Dilophonota*) Möschler. Gundlach. Stahl.

Forbes 30-58.

Erinnyis obscura obscura F.

(as *Dilophonota stheno* Hübner) Stahl. Möschler. Gundlach.

Forbes 30-59: larvae on *Gonolobus* (Asclepiadaceae).

Forbes 31-344: on Vieques Id.

Isongnathus rimosa Grote, var. *wolcottii* Clark, B. P., Proc. New England Zool. Club, Vol. 8, p. 8, January, 1922, TYPE of variety from Porto Rico.

(as *Anceryx rimosa* Dr.) Dewitz.

(as *Dilophonota*) Möschler. Gundlach, "La oruga se cría en *Plumiera*".

Forbes 30-59.

(one unlabeled specimen, TYPE of the variety.)

Pachylia ficus Linn.

Dewitz. Möschler. Gundlach, "La oruga se cría en especies del género *Ficus*".

Van Z. (P. R. 142).

Forbes 30-60: at Coamo Springs.

Forbes 31-344: on Vieques Id.

AMC: at Mayagüez ix-30, Añasco x-30, Coamo xi-30, Santurce vi-30, Luquillo vii-32.

at light (1041-16, 16A-19, 106-24, I No. 490, 2723), at Guánica (379-15, 714-15); larvae on *Ficus repens* (124-21), on *Castilla elastica* (GNW); on *Ficus* sp. at Guánica (493-14).

Epistor lugubris Linn.

(as *Enyo*) Dewitz. Stahl. Möschler. Gundlach, "La oruga vive en varias especies de *Cissus* o *Vitis*".

Forbes 30-61. Forbes 31-344: at Lares.

at light (511-12, 432-16, 72-21, 189-21 I No. 1681 Leonard 33-135).

Madoryx oiclus Cramer

Forbes 30-61.

pupating larva under rose bush at Río Grande (151-23).

Cautethia noctuiformis Walker

(as *Ocnosanda*) Dewitz.

(as *Ocnosanda grotci* Henry Edwards). Möschler. Gundlach. Forbes 30-62.

Aellopos blaini Herrich-Schäffer

(as *Macroglossa acdon* Boisduval) Möschler. Gundlach.

(as *Macroglossa*) Dewitz.

Forbes 30-65.

Aellopos fadus Cramer

Forbes 30-64: at Bayamón (F. Seín).

Aellopos tantalus Linn., var. *zonata* Drury

(as *Macroglossa*) Dewitz. Stahl. Möschler. Gundlach, "Se cría en plantas de la familia de las rubiaceas, v. g., *Genipa*, *Randia*, *Alibertia*".

(as *Sesia*) IP-155: (one unlabeled specimen).

Forbes 30-64: Mayagüez, Descengañó, Aibonito, San Juan, Coamo Springs.

AMC: Mayagüez xii-30.

Aellopos titan Cramer

Forbes 30-64: at Bayamón (F. Seín).

Perigonia lusca Fabr., var. *interrupta* Walker

Dewitz. Möschler. Gundlach, "La oruga vive de *Genipa*, *Rondeletia*, *Gonzalea*, y otras rubiaceas".

Forbes 30-63: larva on coffee.

AMC: at Mayagüez ii-29.

Pholus labruscae Linn.

(as *Philampelus*) Dewitz. Stahl. Möschler. Gundlach, "La oruga se cría en especies del género *Vitis*".

Van Z. (P. R. 1425). Forbes 30-67, at Mayagüez and Ponce.

at light (781-12, 558-16), at Bayamón (I No. 2898); larva on *Cissus sicyoides* at Isabela (I No. 64-31).

Pholus fasciatus Sulzer

(as *Philampelus*) Dewitz. Stahl. Möschler. Gundlach, "La oruga se cría en *Jussiaea*."

Van Z. (P. R. 1426). Forbes 30-66.

AMC: at Mayagüez iv-27, iv-29.

larvae on *Jussiaea* sp. (41-16), common at Martín Peña (152-23).

Pholus vitis vitis Linn.

(as *Philampelus*) Dewitz. Stahl. Möschler. Gundlach, "La oruga se cría en *Cissus (Vitis) sicyoides*".

Forbes 30-65.

AMC: at Mayagüez viii-30.

at light (433-16, 1077-16), at Bayamón (I No. 3211).

Xylophanes chiron Drury var. *nechus* Cramer

(as *Cherocampa nechus* Cr.) Dewitz. Stahl.

(as *Cherocampa chiron* Dr.) Möschler. Gundlach.

Forbes 30-68.

at light (61-16).

Xylophanes pluto Fabr.

(as *Pergesa thorates* Hübner) Dewitz. Möschler.

(as *P. pluto* Fabr.) Gundlach, "La oruga se cría en *Erythroxylon*".

Forbes 30-68. Forbes 31-345: at Coamo Springs.

AMC: Coamo ii-29, Mayagüez v-29.

at light (782-12), at Mayagüez (I No. 3068).

Xylophanes tersa Linn.

(as *Cherocampa*) Dewitz. Stahl. Möschler. Gundlach, "La oruga se cría en *Spermacoce*".

Van Z. (P. R. 1415).

Forbes 30-68: at Naguabo, Coamo, Ponce, Ensenada.

Forbes 31-345: on Vieques Id.

AMC: at Barros x-30, Luquillo vi-32, on seven dates at Mayagüez.

at light (12-12, 433-12, 435-16, 743-16, 23-19, 74-19); at Bayamón (I No. 2319); larvae on *Mitracarpus (Spermacoce) portoricensis* (768-16, 231-21); on *Diodia sarmentosa* at Mayaguez (28-15).

Celerio lineata lineata Fabr.

(as *Deilephila*) Dewitz. Stahl.

(as *D. caucis* Fabr.) Möschler. Gundlach, "He cogido las orugas en *Oenothera* de los jardines, en *Claytonia perfoliata* y en *Boerhaavia*".

Van Z. (P. R. 1424).

Forbes 30-69 and 31-345: Mayagüez, Ponce, Coamo, Aguirre, Cataño.

AMC: at Ponce ix-30, Mayagüez x-30.

at light (783-12), at Guánica (1089-13).

GEOMETRIDÆ

Sabulodes caberata Guenee—det. W. Schaus

at light at Bayamón (I No. 5422).

(Metrocampa proaegrandaria Guenee

AMC: at Mayagüez x-30).

Phrygonis argentata Drury

(as *Eulepidotus*) Möschler. Gundlach.

Phrygonis cultaria Hübner

(as *Eulepidotus*) Stahl. (as *E. paradoxata* Guenee, determination doubtful) Möschler. Gundlach.

Phrygonis polita Cramer

Möschler. Gundlach.

"Probably all three species wrongly identified." W. Schaus.

Chrysocestis fimbriaria Cramer

Möschler. Gundlach.

Stegania subpusaria Herr. Sch.

Möschler. Gundlach.

Numia terebintharia Guenee

(and as *Numia buxaria* Guenee, not in synonymy) Möschler. Gundlach.

Syrrhoedia decrepitaria Hübner

(as *Acroleuca*) Stahl. Möschler. Gundlach.

Casbia sp. nov.—det. W. Schaus.

(Specimens in National Museum.)

Semiothisa enotata Packard

Möschler. Gundlach.

(One unlabeled specimen—det. W. Schaus).

Semiothisa infimata Guenee

Möschler. Gundlach.

Semiothisa diffusata Guenee—det. H. G. Dyar

at light at Guánica (627-13).

Semiothisa bisignata Möschler 89-248, TYPE from Porto Rico.

Gundlach.

Semiothisa celluta Herr. Sch.

Möschler. Gundlach.

Semiothisa sp.—det. W. Schaus

larvae defoliating flamboyant, *Poinciana regia* (827-16), at Guánica (209-15).

Apicia distycharia Guenee

Möschler. Gundlach.

Moschleria hulstii Möschler 89-235, TYPE from Porto Rico.

Gundlach

Drepanodes ephyrata Guenee.

Möschler. Gundlach.

Drepanodes infensata Guenee

Möschler. Gundlach.

Sericoptera mahometaria Herr. Sch.

Stahl.

Sericoptera area Cramer

Möschler. Gundlach.

Nepheloleuca politia Cramer

(as *Urapteryx*) Stahl. (as *Urapteryx* and as *U. complicata* Guenee, not in synonymy) Möschler. Gundlach.

(Three unlabeled specimens—det. W. Schaus), (I No. 2729, 3099).

Microgonia vesulia Cramer

(as *Oxydia quadriagliata* Guenee) Stahl.

(as *Oxydia*) Möschler. Gundlach, "Estas especies varían muchísimo. Möschler describe diez variedades."

Van Z. (P. R. 1450).

at light at Guánica (566-13 det. H. G. Dyar), at Bayamón (I No. 2768, 3460, 3584, 4042); a larva, a large grey looper, on leaves of wild orange at Cayey (35-21) pupated in slight cocoon; larva on *Acalypha wilkesiana* (9-19).

Certima dositheata Guenee

(as *Microgonia*) Möschler. Gundlach.

Azelina vetustaria Walker—det. W. Schaus.

(One unlabeled specimen.)

Pero rectisectaria Herr. Sch.

Möschler. Gundlach.

Pero curvistrigaria Herr. Sch.

Stahl.

Thysanopyga apicitruncaria Herr. Sch.

Möschler. Gundlach.

Brothis vulneraria Hübner

Stahl. Möschler. Gundlach.

Alcis abjectaria Herr. Sch.

(as *Boarmia*) Möschler. Gundlach.

Alcis delicata Butler

(as *Boarmia*) Möschler. Gundlach.

Alcis hilararia Möschler (as *Boarmia*) 89-266, TYPE from Porto Rico.

(as *Boarmia*) Gundlach.

Alcis momaria Guenee

(as *Boarmia*) Möschler. Gundlach.

(One unlabeled specimen—det. W. Schaus).

Bronchelia pudicaria Guenee

(as *Boarmia*) Stahl. Möschler. Gundlach.

Bronchelia scolopacea Drury

(as *Boarmia*) Möschler. Gundlach.

Amphidasys arnobia Cramer

(as *Thyrintina quadricostaria* Herr. Sch.) Möschler. Gundlach.

Bombycodes simplicaria Guenee

Möschler. Gundlach.

Melanchroia geometroides Walker

Stahl.

Melanchroia cephise Cramer

Van Z. (1663) on *Phyllanthus lathyroides*.

Van Zwaluwenburg 15-31: "a local outbreak at Camuy, where the larvae practically stripped the grosella trees, *Phyllanthus distichus*."

AMC: at Yabucoa vii-30, Mayagüez. (x-30, xii-30).

on weeds in cane fields (105-12, 828-16), at flowers of *Mitrocarpus portoricensis* (719-14 det. Dyar), at flowers of *Heliotropium* at Ñasco (507-13); at light at Bayamón (I No. 3047), at Peñuelas (I No. 4586); on eggplant at Manatí (I No. 313); on geranium leaf at Bayamón ((I No. 2901); larvae on *Phyllanthus lathyroides* (718-14, 720-14, 316-16, 327-16, 548-16).

Hydratoscia fenestraria Guenee—det. A. G. Dyar

Van Z. (1601) on *Genipa americana*.

larvae on leaves of unidentified tree (175-21) have dark purplish-brown head and five large irregularly rectangular spots of this color on the anterior abdominal segments, alternating with areas of dull green (the ground color) of approximately the same size, with small purplish spots on the second and third thoracic segments, and smaller purplish spots on the other segments.

Cnemodes perletaria Möschler 89-240, TYPE from Porto Rico.

Gundlach.

Cnemodes malefidaria Möschler 89-240, TYPE from Porto Rico.

Gundlach.

Zonosoma occipitraria Herr. Sch.

Stahl. Möschler. Gundlach.

Zonosoma delectabiliaria Möschler 89-236. TYPE from Porto Rico.

Gundlach.

Hyria opulentaria Möschler (as *Acidalia*) 89-237, TYPE from Porto Rico.

(as *Acidalia*) Gundlach.

(I No. 2609), at Utuado (W. A. Hoffman).

Hyria flavomarginata Möschler (as **Acidalia**) 89-237, TYPE from Porto Rico.

(as *Acidalia*) Gundlach.

at light at Bayamón (I No. 2752), at Utuado (W. A. Hoffman).

Idaea chionaeata Herr. Sch.

(as *Acidalia*) Stahl. Möschler. Gundlach.

(One unlabeled specimen—det. W. Schaus).

Idaea eburneata Guenee

(as *Acidalia*) Möschler. Gundlach.

Idaea tortuosaria Möschler (as **Acidalia**) 89-237, TYPE from Porto Rico.

(as *Acidalia*) Gundlach.

Ptychopoda offendata Möschler (as **Acidalia**) 89-238, TYPE from Porto Rico.

(as *Acidalia*) Gundlach.

Craspedia crenatilineata Warren—det. W. Schaus.

(One unlabeled specimen.)

Pleuroprucha molitaria Möschler 89-238, TYPE from Porto Rico. Gundlach.

Hemiptilota insulsaria Guenee—det. W. Schaus.

from pupa on cane leaf at Yauco (259-21).

Leptostales oblinataria Möschler 89-239, TYPE from Porto Rico.

Leptostales devolutaria Möschler 89-239, TYPE from Porto Rico. at light (I No. 5000), at Bayamón (I No. 3453).

Leptostales praepeditaria Möschler 89-239, TYPE from Porto Rico.

Leptostales mutuataria Möschler 89-239, TYPE from Porto Rico.

Leptostales tumidaria Möschler 89-240, TYPE from Porto Rico.

Leptostales instutaria Möschler 89-240, TYPE from Porto Rico. Gundlach.

“Most of these names are probably synonyms.” W. Schaus.

Apallacta pryrrhularia Möschler 89-242, TYPE from Porto Rico. Gundlach.

Calyptocoma phorcaria Guenee

(as *Zonosoma*) Möschler. Gundlach.

Racheospila confundaria Möschler 89-242, TYPE from Porto Rico. Gundlach.

Racheospila ocellata Stoll

Möschler. Gundlach.

- Phrudocentra centrifugaria** Herr. Sch.
(as *Racheospila anomalaria* Möschler 89-243, TYPE from Porto Rico) Gundlach.
- Eucrostis albocostaria** Herr. Sch.
Stahl. Möschler. Gundlach.
- Geometra attendaria** Möschler 89-243, TYPE from Porto Rico.
Gundlach.
at light at Bayamón (I No. 2312, 2363).
- Scordylia quadruplicaria** Hübner
Möschler. Gundlach.
- Cambogia snellenaria** Möschler
(as *Asthena*) Möschler. Gundlach.
- Pterocypha praecurraria** Möschler (as **Spargania**) 89-269, TYPE
from Porto Rico.
Gundlach.
- Pterocypha defensata** Walker—det. W. Schaus.
(One unlabeled specimen.)
- Rhopalodes castniata** Guenee
Möschler. Gundlach.
"Probably wrong." W. Schaus.
- Cidaria aristata** Herr. Sch.
Möschler. Gundlach. (as *Larentia*) Stahl.
- Cidaria baliata** Herr. Sch.
Möschler. Gundlach.
- Cidaria balteolata** Herr. Sch.
Möschler. Gundlach. (as *Larentia*) Stahl.
- Cidaria elutata** Herr. Sch.
(as *Larentia*) Stahl.
- Cidaria chloronotata** Möschler 89-273, TYPE from Porto Rico.
Gundlach.
- Cidaria vinaceata** Möschler 89-274, TYPE from Porto Rico.
Gundlach.
- Terenodes aureocapitaria** Möschler 89-274, TYPE from Porto Rico.
Gundlach.
- (**Terenodes mirandilis**
Stahl.)
- Syllexis intamiataria** Möschler 89-241, TYPE from Porto Rico.
Gundlach.
- Mecoceras nitocris** Cramer
Möschler. Gundlach. AMC: at Mayagüez xi-30.

- (*Almodes squamigera* Felder
(as *Boarmia*) Möschler. Gundlach.
"not found in P. R." W. Schaus.)

EPIPLEMIDÆ

- Trotorhombia metachromata* Walker
Lep. Cat. xxx, p. 6: from P. R.
possibly the following. W. T. M. Forbes.
- Nedusia excavata* Möschler 89-244, TYPE from Porto Rico.
Gundlach. Forbes 30-71: Coamo.
Forbes 31-345: at Jájome Alto.
- Syngria reticularia* Möschler 89-256, TYPE from Porto Rico.
Gundlach. Forbes 30-714.
- Syngria ramosaria* Möschler 89-256, TYPE from Porto Rico.
Gundlach. Forbes 30-71.
- Cerasympiasta marsitata* Möschler 89-261, TYPE from Porto Rico.
Gundlach.
- Cerasympiasta sanata* Möschler 89-262, TYPE from Porto Rico.
Gundlach.
- Epiplema ineptaria* Möschler 89-262 (as *Erosia*) TYPE from Porto Rico.
Gundlach.
Forbes 30-72 and 31-345: at Coamo Springs, San Germán and Dorado.
- Erosia excludaria* Möschler 89-262, TYPE from Porto Rico.
Gundlach. Forbes 30-72: as *Epiplema*.
- Erosia obvallataria* Möschler 89-263, TYPE from Porto Rico.
Gundlach. Forbes 30-72: as *Epiplema*.

PYRALIDÆ (PYRALIDIDÆ)

PYRAUSTINÆ

- Homophysa dolatalis* Möschler 89-321: TYPE from P. R.
Gundlach.
at light at Bayamón (I No. 23135, 2366, 2652, 2912, 3455, 3931, 4668), at Utuado (W. A. Hoffman); resting on orange at Adjuntas (I No. 3995), on banana at Bayamón (I No. 2147).
- Lipocosma hebescalis* Möschler 89-316, TYPE from Porto Rico.
Gundlach.
at light at Bayamón (I No. 2309 Leonard 33-126, 3105).
- Zinckenia fascialis* Cramer
(as *Z. recurvalis* Fabr.) Stahl. Möschler. Gundlach, "La oruga se cría en *Amaranthus* y *Celosia*."
Van Z. (P. R. 1409). Jones 15-8: on *Amaranthus*.

EEP-110: on beets.

Cotton 18-280: "webbing and skeletonizing the leaves of beets."
(as *Hymenia*) Leonard 32-115: at light at Aguirre; larvae on beets, Swiss; chard at Palo Seco, and on *Gomphrena dispersa*.
common at light (I No. 850), at Guánica (609-13 det. H. G. Dyar), at Bayamón (I No. 2632, 2762), resting on eggplant at Manatí (I No. 570); on tomato at Vega Baja (I No. 572), at Ponce (I No. 3218), on squash at Manatí (I No. 653, 654, 657); larvae on *Amaranthus* (546-12, 703-17), at Guánica (214-15); on Swiss chard (550-17); on beets at Vega Alta (I No. 3215).

Zinckenia perspectalis Hübner

Möschler. Gundlach. Van Z. (P. R.1437).

(I No. 853), common at light at Guánica (598-13 det. H. G. Dyar); larvae on *Synedrella nodiflora* (366-16, 747-16, 1118-16), on *Eleutheranthera ruderalis* (399-16), on *Wedelia trilobata* (774-16, 881-16), on *Melanthera canescens* (799-16), on *Verbesina alba* (916-16)—all collections and rearing by E. G. Smyth; on Swiss chard at Bayamón (I No. 5281-13).

Pycnarmon receptalis Walker

(as *Spilomela personalis* Herr. Sch.) Möschler. Gundlach.

Desmia tages Cramer

Stahl. (as *Desmia sertorialis* Herr. Sch.) Möschler. Gundlach.

Desmia ufeus Cramer

(as *Desmia orbalis* Guence and as *Desmia viduatalis* Möschler 89-311, TYPE from Porto Rico) Möschler. Gundlach.
at Camuy (EGS) resting on *Crotalaria* at Naguabo (I No. 3108); larvae on *Cissus sicyoides* (562-21 det. W. Schaus).

Desmia nacialis Snell

Möschler. Gundlach: possibly the female of *Desmia amillalis* Snell.

Maruca testulalis Geyer—det. H. G. Dyar

Cotton 18-279; as the "Bean Pod-Borer", notes and control. EEP-108: on beans.

"Report of Hearing Held by the Federal Horticultural Board to Consider the Advisability of Restricting or Prohibiting the Entry from Porto Rico of Fruits and Vegetables into the United States." Jour. Dept. Agr. P. R., Vol. 8, No. 1, pp. 5-46, pl. 1. San Juan, August 1925: "new to and not heretofore widely prevalent or distributed within and throughout the Continental United States."

"Fruit and Vegetable Quarantine of Porto Rico Notice of Quarantine of Porto Rico Notice of Quarantine No. 58." Fed. Hort. Board, U. S. Dept. Agr., Washington, D. C., May 27, 1925.

Leonard & Mills 31-467 to 469: more abundant during winter; attacking string beans and lima beans.

Leonard, M. D. & Mills, A. S., "The Eggs of the Lima Bean Pod Borer in Porto Rico." Jour. Ec. Ent., Vol. 24, No. 3, p. 763.

Geneva, N. Y., June 1931: discovery of the eggs on leaves and blossom-buds; description.

Leonard 31-117, 146 & Colón 31-132: mention.

Leonard 32-122: more abundant in fall and winter on *Crotalaria*.

Faxon & Trotter 32-440: quarantine and survey.

Wolcott 33-341: spraying experiments; larvae differentiated from *Etiella* and *Fundella*.

Wolcott 33-47: beginning of investigations.

Wolcott 34-90; summary of investigations to date.

EEWI-615: importance of, mainly because of quarantine restrictions.

(198-12, 792-12), common at light at Guánica (583-13); larvae in sword beans (868-14), at Isabela (158-13); in pigeon peas at Palmer (I No. 769), at Arecibo (I No. 1838); rare in lima beans at Isabela (137-31); twenty-six interception records in lima beans, at Loíza, Río Piedras, Caguas, Cidra, Cayey, Bayamón, Vega Baja, Barceloneta, Arecibo and Isabela; thirteen interception records in string beans, at Río Piedras, Carolina, Caguas and Manatí.

***Synclera traducalis* Zeller**

Möschler. Gundlach. (as *Pagyda*) Van Z. (P. R. 1440).

at light at Guánica (607-13 det. H. G. Dyar), at Bayamón (I No. 5031)

***Ercta vittata* Fabr.**

(as *Euclasta torquillalis* Möschler 89-302: TYPE from P. R.) Gundlach.

rare at light (I No. 4852), at Guánica (652-13 det W. Schaus).

***Marasmia cochrusalis* Walker**

(as *Cnaphalocrocis perspersalis* Möschler 89-293, TYPE from Porto Rico) Gundlach.

(One unlabeled specimen—det. W. Schaus), at light Bayamon (I No. 2647, 3104).

***Marasmia similis* von Hedemann—det. W. Schaus**

EEWI-207: mention.

on sugar-cane at Isabela (166-31).

***Marasmia trapezalis* Guenee—det. W. Schaus**

at light at Bayamón (I No. 3775).

***Syngamia cassidalis* Guenee—det. W. Schaus**

at light at Bayamón (I No. 3155).

***Syngamia cognatalis* Snell**

(as *Salbia*) Möschler. Gundlach.

Syngamia florella Cramer

Stahl. Möschler. Gundlach.

(I No. 851, 669-12 det. W. Schaus); at Aibonito (SSC), at light at Bayamón (I No. 2631), at Mayagüez (I No. 4980); resting on ñame at Isabela (I No. 5825).

Syngamia haemorrhoidalis Guenee

(as *Salbia*) Möschler. Gundlach.

Syngamia praeformatalis Möschler (as *Salbia*) 89-291, TYPE from Porto Rico.

(as *Salbia*) Gundlach.

Hileithia ductalis Möschler 89-292, TYPE from Porto Rico. Gundlach.

(One unlabeled specimen—det. W. Schaus), at light at Bayamón (I No. 3154, 3454, 5030), at Utuado (W. A. Hoffman).

Samea ecclesiialis Guenee

(as *Samea castellalis* Guenee) Stahl. Möschler. Gundlach.

(I No. 868, 1817 Leonard 33-136, 2324), at light at Bayamón (I No. 3537); resting on pepper leaf at Bayamón (I No. 601).

Trithyris quadrifenestalis Herr. Sch.

(as *Coenostola*) Möschler. Gundlach.

Diastichtis argyralis Hübner

(as *Botys*) Stahl. Möschler. Gundlach.

Pilocrocis lauralis Walker

(as *Spilomela pervialis* Herr. Sch.) Möschler. Gundlach.

Pilocrocis tripunctata Fabr.

(as *Acrospila compalis* Guenee) Stahl. Möschler. Gundlach.

Jones 15-9: "Sweet-potato leaves---webbed together and injured by the larva." Illustration of adult.

Cotton 18-309: notes.

EEP-123: on sweet potato.

larvae on sweet-potato (894-13, 723-17), on *Ipomoea bonanox* (709-16); adult at light at Bayamon (I No. 2637, 2849).

Pilocrocis infuscalis Guenee

(as *Botys pruinalis* Lederer) Möschler. Gundlach.

Mescondyla concordalis Hübner

(as *Acrospila*) Möschler. Gundlach.

at light, at Bayamón (I No. 2850, 3320), at Mayagüez (I No. 4988). at Guánica (648-13 det. H. G. Dyar); larvae on leaves of calabash tree, *Crescentia cujete* (786-12, 934-16), at Ciales (596-21); on leaves of robele tree, *Tecoma pentaphylla* (26-14), at Dorado (544-22).

Mesocondyla gastralis Guenee

(as *Acrospila*) Möschler. Gundlach.

Conchylodes diphteralis Hübner

Stahl. (as *Ledereria*) Möschler. Gundlach, "La oruga en especies de *Cordia*, y la crisálida en su capullo, hace saltar este a distancia de algunas pulgadas."

Dichogamma amabilis Möschler 89-296, TYPE from Porto Rico. Gundlach.

Dichogamma bergii Möschler 89-297, TYPE from Porto Rico. Gundlach.

Dichogamma fernaldi Möschler 89-297, TYPE from Porto Rico. Gundlach.

Dichogamma innocua Fabr.

(as *D. krugii* Möschler 89-296, TYPE from Porto Rico) Gundlach.

Dichogamma redtenbacheri Lederer

Möschler. Gundlach.

three adults at light at Guánica (631-13 det. H. G. Dyar).

Phostria prolongalis Guenee

(as *Microthyris*) Möschler. Gundlach.

Phostria humeralis Guenee

(as *Omiodes*) Möschler. Gundlach.

at light at Utuado (W. A. Hoffman).

Phostria insolutalis Möschler (as *Omiodes*) 89-301, TYPE from Porto Rico.

(as *Omiodes*) Gundlach.

Phostria martyralis Lederer

(as *Coenostola*) Möschler. Gundlach.

Coenostola eruptalis Lederer

Möschler. Gundlach.

Lamprosema ebullialis Guenee—det. W. Schaus

Leonard 33-136: from El Yunque, Lares and Santurce.

(as *Sisyracera preciosalis* Möschler) Möschler. Gundlach.

Lamprosema xanthialis Guenee

(as *Botys incalis* Snell. var. *rosealis* Möschler 89-285 TYPE, of the variety from Porto Rico) Gundlach.

at light at Bayamón (I No. 2767, 4218).

Lamprosema inabsconsalis Möschler (as *Diasemia*) 89-306, TYPE from Porto Rico.

(as *Diasemia*) Gundlach.

Lamprosema zoilusalis Walker

(as *Botys hilaralis* Möschler) Möschler. Gundlach.

at light at Bayamón (I No. 3539), at Mayagüez (I No. 4335. 4989), at Utuado (W. A. Hoffman).

Lamprosema indicata Fabr.

(as *Hedylepta vulgaris* Guenee) Stahl. Möschler. Gundlach,
"La oruga se cría entre las hojas reunidas de plantas de la
familia de las papilionáceas."

(as *Nacoleia*) Jones 15-9: larvae on beans and cowpeas. Illus-
tration of adult. Cotton 18-278: as the "Bean Leaf-Webber."
"The small dirty-green colored larva webs the leaves (of bean)
together, living between them and skeletonizing them with its
feeding." Control.

EEP-108 and EEWI-609: on beans.

AMC: at Mayagüez and Añasco.

larvae on cowpeas (2-12), on beans (RTC) on lima beans
(I No. 1688 Leonard 32-123), on leares of derris, *Derris elliptica*
(43-34), on *Lantana camara* (763-16), on *Meibomia tortuosa*
(1091-16), on *Vigna repens* (1136-16); on peas and beans at
Vega Baja (362-21), parasitized by *Argyrophylax albincisa*
Wied., a Tachinid fly; at Bayamón (I No. 3158), at Mayagüez
(I No. 4981), resting on eggplant at Manatí (I No. 567).

Lamprosema lunulalis Hübner

Möschler. Gundlach.

Sylepta gordialis Guenee

(as *Asciodes*) Stahl. Möschler. Gundlach.

larvae on leaves of Bougainvillea vine (2-26), at Pt. Can-
grejos (GNW—det. H. G. Dyar), at Isabela (165-31); adults
at light at Bayamón (I No. 2915, 3319).

Sylepta titubalis Möschler (as *Asciodes*) 89-303, TYPE from Porto
Rico.

(as *Asciodes*) Gundlach.

Sylepta scopulalis Guenee

(as *Asciodes*) Möschler. Gundlach.

Sylepta helcitalis Walker

(as *Crossophora miscellalis* Möschler 89-308, TYPE from Porto
Rico) Gundlach.

EEWI-642: in P. R.

Sylepta patagialis Zeller

(as *Herpetogramma servalis* Lederer) Möschler. Gundlach.

Sylepta silicalis Guenee—det. H. G. Dyar

larva a leaf-roller on *Didymopanax morototoni* at Lares
(133-22).

Sylepta elevata Fabr.—det. H. G. Dyar

at light (394-16), at Guánica (595-13), at Bayamón (I No.
2040).

Sylepta onophasalis Walker—det. W. Schaus.

(One unlabeled specimen.)

Sathria stercoralis Lederer

Stahl. Möschler. Gundlach.

Lygropia lelex Cramer

(as *Cyclosena gestatalis* Möschler 89-309, TYPE from Porto Rico) Gundlach.

EEWI-642 on sweet potato leaves.

larva on *Ipomoea* sp. (564-21 det. W. Schaus).

Margaronia flegia Cramer—det. W. Schaus.

larva on *Thevetia thevetia* at Pt. Salinas (Plantaje). (695-16), at Isabela (44-33).

Margaronia aurocostalis Guenee

(as *Pachyarches*) Möschler. Gundlach.

at light at Guánica (672-13 det. W. Schaus); larva on leaf of *Rauwolfia nitida*, folding over half of it to make a bag, in which it lived and on the interior of which it fed at Camuy (331-22); rolling leaves of a wild bean at Boquerón (90-23).

Margaronia nitidalis Cramer

(as *Phacellura*) Möschler. Gundlach. (as *P. hylinasalis*) Stahl.

Seín, F., "The Pickle Worm in Chayote in Porto Rico." Jour. Ec. Ent., Vol. 24, No. 3, p. 762. Geneva, N. Y., June 1931: at Lares, 20% of fruit infested, at Río Piedras, 5 to 10%. in cucumbers at Manatí (I No. 191), at Vega Baja (I No. 214), at Loíza (I No. 2224 Leonard 32-132 and 33-114), at Isabela (177-31); in chayote (35-33), at Lares (2-30 Leonard 32-124).

Margaronia infernalis Möschler (as *Phacellura*) 89-300, TYPE from Porto Rico.

(as *Phacellura*) Gundlach.

Margaronia hyalinata Linn.

(as *Phacellura*) Möschler. Gundlach, "La oruga se cría en cucurbitáceas y también en *Ipomoea*."

(as *P. immaculalis* Guenee) Stahl.

(as *Diaphania*) Barrett 03-448; Jones 16-8; Cotton 18-294; Van Z. (920) on Cucurbitaceae.

EEI-118: on cucumbers.

AMC: twelve collections.

at light (51-12, 159-12, 24-19), at Guánica (602-13) very common, at Mayagüez (I No. 5165), at Coamo (I No. 1230); larvae on cucumbers (106-12, 547-17, 629-17, 633-17), at Caguas (I No. 1885), at Ponce (I No. 3472 Leonard 32-132 and 33-114); on cantaloupe (286-16); on watermelon (314-16), at Isabela (139-31); on casavva melon at Loíza (I No. 1741, 1921); on squash at Vega Alta (I No. 1737), at Bayamón (I No. 3467); on cocozelle squash blossoms (I No. 3521-B); on yautia at Adjuntas (I No. 4591).

Margaronia elegans Möschler (as *Phacellura*) 89-299, TYPE from Porto Rico.

(as *Phacellura*) Gundlach.
on medical herbs (I No. 1067 det. Carl Heinrich).

Margaronia fuscicaudalis Möschler

(as *Phacellura*) Möschler. Gundlach.

Margaronia lucidalis Hübner

(as *Phacellura*) Stahl. Möschler. Gundlach.

Margaronia quadristigmalis Guenee

(as *Margarodes*) Möschler. Gundlach.

at light at Guánica (672-13 det. W. Schaus), at Bayamón (I No. 2639).

Margaronia isoscelalis Guenee

(as *Margarodes*) Möschler. Gundlach.

Margaronia sibilalis Walker

(as *Glypodes*) Möschler. Gundlach.

(Unlabeled specimens—det. W. Schaus); larva on *Morus alba* (410-22), at light at Bayamón (I No. 2751, 2918).

Margaronia ausomia Cramer

(as *Hoterodes*) Stahl. Möschler. Gundlach.

Diaphantia conspicualis Möschler 89-314, TYPE from Porto Rico. Gundlach.

Agathodes designalis Guenee

(as *Stenurges*) Möschler. Gundlach.

AMC: at Añasco x-30, Mayagüez x-24. xiii-28, xii-30, v-34.

larva on *Erythrina glauca* (869-16, 327-21 det. H. G. Dyar) rolling leaves and boring in stem; on *Citharexylum fruticosum* (15-17); fully grown larvae boring in bark of large *Erythrina glauca* and *Inga vera* trees at Cayey (381-22); adult at light at Mayagüez (I No. 4990).

Cliniodes semilunalis Möschler 89-297, TYPE from Porto Rico. Gundlach.

Syllepsis marialis Poey

Möschler. Gundlach.

Leucinodes elegantalis Guenee

Möschler. Gundlach.

at light (636-16, 197-17 det. W. Schaus), at Bayamón (I No. 2485, 3048 Leonard 33-175, 3325, 5258).

Ommatospila narcaeusalis Walker

(as *O. nummulalis* Lederer) Möschler. Gundlach.

(Unlabeled specimens—det. W. Schaus.)

Hellula phidilealis Walker det. W. Schaus

(One unlabeled specimen.)

Hellula undalis Fabr.

Möschler. Gundlach.

(as *Botys*) Möschler. Gundlach.

Epipagis cambogialis Guenee

(one unlabeled specimen det. W. Schaus); at light at Utuado
(W. A. Hoffman).

Epipagis conjunctalis Möschler (as **Samea**) 89-290, TYPE from
Porto Rico.

(as *Samea*) Gundlach.

Epipagis mopsalis Walker—det. W. Schaus

at light at Bayamón (I No. 3456).

Epipagis togalis Lederer

(as *Botys*) Stahl. Möschler. Gundlach.

Terastia meticulosalis Guenee—det. Schaus & Dyar

larvae bore in twigs of *Erythrina glauca* trees, ninety per
cent of those in an experimental planting at the Station being
infested (326-21); adults at light at Bayamón (I No. 3367),
at Mayagüez (I No. 4987), at Utuado (W. A. Hoffman).

Orobna implicitalis Möschler 89-292: TYPE from P. R. = **Crocido-**
lomía palindialis Guenee—synonymy by W. Schaus.

Gundlach.

at Vega Alta (I No. 2813).

Catacteniza (Azochis) euvexalis Möschler 89-314, fig. 13, TYPE
from Puerto Rico.

Gundlach.

at light at Guánica (647-13 det. W. Schaus).

Crocidophora huronalis Guenee

(as *Stenophyes serinalis* (Walker) Möschler. Gundlach.

(810-14 det. Dyar), from Algarrobo (814-14).

Psara periusalis Walker

(as *Pachyzancla*) Jones 15-9: "The young larvae live at first
as miners in the leaves (of eggplant and *Solanum torvum*),
but later web the leaves together." Notes and description of
adult. Illustration of work. Cotton 17-109; "The Tobacco
Leaf-Folder"—an extended account (5 pp.) with description
of all stages, life-history and control. Cotton 18-299: as
leaf-folder of eggplant, notes and control.

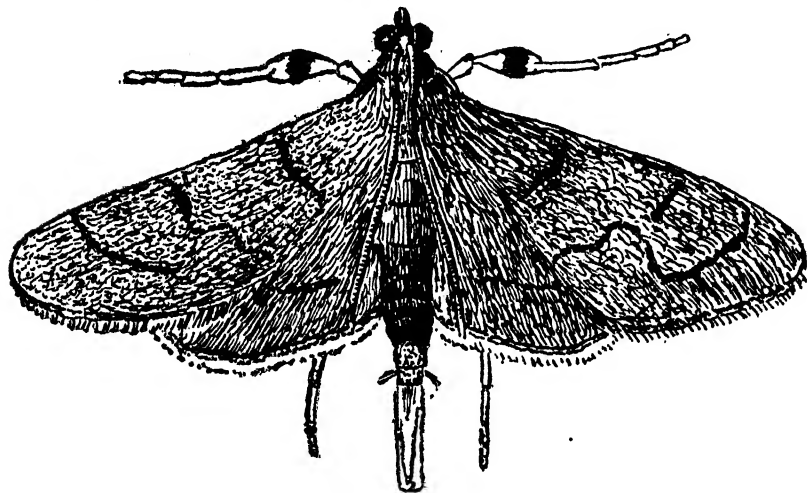
Wolcott 22c-10: "El Pega-pega del Tabaco".

Langston, J. M., "The Tobacco Leaf-Folder of Porto Rico attacks
Tomatoes in Mississippi." Qty. Bull. State Plant Bd. Miss.,
Vol. 2, No. 4, pp. 7-9. A. & M. College, Miss., 1923.

EEP-89 and LEWI-563: "El Pega-pega del Tabaco;" economic accounts.

Leonard 31-118, 32-132 & 33-141: host and locality records.

EEWI-2: internal organs visible thru transparent skin of larva. comon at light at Guánica (663-17) at Bayamón (I No. 3535); larvae on *Solanum torrum* (176-12, 397-16, 796-16,



Psara periusalis Walker. Six times natural size.
(Drawn by G. N. Wolcott.)

924-16), on eggplant (787-12, 984-10, I No. 1271), on *Solanum nigrum* (367-16, 745-16), on tomato (189-15), at Guaynabo (I No. 3469); on wild tomato (826-16): on tobacco (94-20), at Juncos (I No. 5212), at Aguadilla (137-20), at Cayey (9-23), the most abundant insect on shade grown tobacco, but less abundant on the sunny hills.

***Psara phaeopteralis* Guenee—det. H. G. Dyar**

EEWI-262: a pest of St. Augustine grass.

Leonard 32-133: on *Gomphrena dispersa*.

larvae abundant in pasture eating St. Augustine or "gramma" grass, *Stenotaphrum secundatum*, at Hatillo (224-21), at Isabela (108-31 Leonard 33-116), at Santurce (75-33); adults at light (I No. 1816, 2785), at Bayamón (I No. 2317, 2496, 3056, 3534), at Dorado (I No. 2725), resting on tomato plant at Manatí (I No. 566).

***Psara bipunctalis* Fabr.**

(as *Botys detritalis* Guenee) Möschler. Gundlach.

(as *Pachyzancla*) Jones 15-8: on *Amaranthus*. Cotton 18-280: "on beets, chard and *Amaranthus*." Notes and control. Van Z. (P. R. 1438).

EEP-110: on beets.

at light (I No. 855, 872, 1682, 2775), at Guánica (601-13, 661-13), at Bayamón (I No. 3054); larvae on *Amaranthus* (178-11, 219 to 223-11, 336-16, 355-16), on beets (408-13), on eggplant (1008-16). on swiss chard (551-17, 584-17, 589-17), at Bayamón (I No. 5281); on *Achryanthes indica* (898-16), on *Borreria ocimoides* (880-16); on pepper at Humacao (I No. 1867 (as *Psara detritalis* Guenee) Leonard 33-131).

Phlyctaenodes bifidalis Fabr.

(as *Eurycreon evanadalis* Berg.) Möschler. Gundlach.

Van Z. (P. R. 1407).

common at light at Guánica (597-13, det. Dyar & Schaus).

Phlyctaenodes collucidalis Möschler (as **Eurycreon**) 89-290, TYPE from Porto Rico.

(as *Eurycreon*) Gundlach.

"Probably a variety of *similalis* Guenee." W. Schaus.

Phlyctaenodes nudalis Hübner

(as *Eurycreon*) Möschler. Gundlach.

Phlyctaenodes ? placendalis Möschler (as **Botys**) 89-285, TYPE from Porto Rico.

(as *Botys*) Gundlach.

Phlyctaenodes ? pertentalis Möschler (as **Botys**) 89-284, fig. 7, TYPE from Porto Rico.

(as *Botys*) Gundlach.

Phlyctaenodes similalis Guenee—det. H. G. Dyar

at light at Guánica (662-13).

Phlyctaenodes viscendalis Möschler (as **Botys**) 89-285, TYPE from Porto Rico.

(as *Botys*) Gundlach.

Diasemia ramburialis Dup., var. **minimalis** Möschler 89-306, TYPE of the variety from Porto Rico.

Gundlach.

at light at Bayamón (I No. 4220).

Sparagmia gigantal Guenee

Möschler. Gundlach.

larva on grayumo macho, *Didymopanax morototoni* at Lares (159-22 det. W. Schaus); adult at light (I No. 1815).

Mecyna glivata Fabr.

(as *Botys polygonalis* Hübner) Möschler. Gundlach.

Phlyctaenia rubigalis Guenee—det. C. Heinrich

larvae eating string bean leaves (I No. 1070, 1071 Leonard 32-123).

Pyrausta cerata F.—synonymy by W. Schaus

(as *Botys oedipodalis* Guenee) Möschler. Gundlach.

(as *Pyrausta mellinalis* Hübner) Va. Z. (P. R. 1411).

(as *Epicorisa mellinalis* Hübner) IP-193; very common at light at Guánica (581-13 det. H. G. Dyar); larvae abundant on *Citharexylum fruticosum* and *Vitex divaricata* at Aibonito and Trujillo Alto (63-23); description of larvae and cocoon. at light (I No. 1818).

Pyrausta cardinalis Guenee

(as *Botys*) Möschler. Gundlach.

at light at Aibonito (SSC—det. W. Schaus).

Pyrausta episcopalis Herr. Sch.

(as *Botys*) Möschler. Gundlach.

on grapefruit blossom at Bayamón (I No. 5418).

Pyrausta ebulealis Guenee—det. W. Schaus

at light at Bayamón (I No. 5131).

Pyrausta gracilalis Herr. Sch.

(as *Botys*) Möschler. Gundlach.

Pyrausta glorialis Herr. Sch.

(as *Botys*) Möschler. Gundlach.

Pyrausta oculatalis Möschler (as *Botys*) 89-282, TYPE from Porto Rico.

(as *Botys*) Gundlach.

Pyrausta illutalis Guenee

(as *Condylorrhiza*) Möschler. Gundlach.

Pyrausta phoenicealis Hübner

(as *Botys* and as *Botys insignitalis* Guenee) Möschler. Gundlach.

larva on *Hyptis capitata* (323-16 det. W. Schaus); at light at Bayamón (I No. 2851, 3540).

Pyrausta tyralis Guenee

(as *Botys diffusa* G. & R.) Möschler. Gundlach.

Botys citrinalis Möschler 89-282, TYPE from Porto Rico.

Botys albifrontalis Möschler 89-284.

Botys villicalis Möschler (described from Jamaica).

Botys principaloides Möschler 89-285.

Botys intricatalis Möschler 89-286.

Botys terricolalis Möschler (described from Surinam).

Botys evincalis Möschler 89-287.

Botys concinnalis Möschler 89-287.

Botys fortificalis Möschler 89-288.

Botys secernalis Möschler 89-288.
at light at Utuado (W. A. Hoffman).

Botys flammeolalis Möschler 89-289.
Gundlach.
"Not placed" by W. Schaus.

Noctuelia thalialis Walker
Van Z. (P. R. 1412).
very common at light at Guánica (636-13 det W. Schaus).

Stenoptycha pterophoralis Walker
(as *Lineodes gracilalis* Herr. Sch.) Möschler. Gundlach.

Lineodes metagrammalis Möschler 89-305, TYPE from Porto Rico.
Gundlach
at light (I No. 3039) at Bayamón (I No. 3055, 3926), at
Utuado (W. A. Hoffman).

Lineodes triangulalis Möschler 89-305, TYPE from Porto Rico.
Gundlach.
at light at Mayagüez (I No. 5163).

Cerobasis pachylefidella Hamp.
Van V. (1612) or (62) on *Hepatica (Herpetica) alata*.

NYMPHULINÆ

Paraponyx infirmalis Möschler
Möschler. Gundlach.

Paraponyx rugosalis Möschler 89-318, TYPE from Porto Rico.
Gundlach.
(One unlabeled specimen—det. W. Schaus.)

Paraponyx vestigialis Snell
Möschler. Gundlach.

Cataclysta angulatalis Lederer
Möschler. Gundlach.

Cataclysta miralis Möschler 89-319, TYPE from Porto Rico.
Gundlach.
(Unlabeled specimens—det. W. Schaus.), at light at Bayamón (I No. 2310 Leonard 33-126, 2799), at Utuado (W. A. Hoffman); resting on kumquat leaf (I No. 2043), at Trujillo Alto (I No. 691).

Cataclysta minimalis Herr. Sch.
Stahl.

Cataclysta opulentalis Lederer
Möschler. Gundlach.

Cataclyta sumptuosalis Möschler 89-319, TYPE from Porto Rico.
Gundlach.
at light (I No. 4566), at Bayamón (I No. 3152).

Argyractis moniligeralis Lederer—det. W. Schaus
at light at Bayamón (I No. 3773, 4137, 4219, 4881).

Argyractis plusialis Herr. Sch.—det. W. Schaus.
common at light at Guánica (646-13).

Piletocera bufalis Guenee
(as *Penestola praeficalis* Möschler 89-316; TYPE from P. R.
Gundlach 91-553, No. 540.
at light (I No. 2784).

Somatania pellucidalis Möschler 89-301, fig. 22. TYPE from Porto Rico.
Gundlach 91-545, No. 505.
" = *Stenia samealis* Dyar" W. Schaus.

ENDOTRICHINÆ

Perforadix sacchari Seín, F., "The Sugar-Cane Root Caterpillar and other New Root Pests in Puerto Rico." Jour. Dept. Agr. P. R., Vol. 14, No. 3, pp. 167-191, pl. 10. San Juan, August 1930: TYPE from P. R.

(as *Sufetula grumalis* Schaus—det. H. G. Dyar) López Domínguez 27-46: the first record of F. Seín's observation of the attack of these caterpillars on the roots of sugar-cane.

Seín 29-89: progress of investigations.

Seín 32 a-1: mention.

Leonard 31-112 & 31-144: summary of Seín's observations.

EEWI-156 to 158: quoting Seín.

larvae boring in tender roots of sugar-cane (1-26); adults at light at Bayamón (I No. 2795, 3177, 3929, 4193, 5242).

EPIPASCHINÆ

Tetralopha scabridella Ragonot.
Möschler. Gundlach.

Brown larvae with lighter-colored medio-dorsal stripe bordered with black, web together several terminal leaves of *Inga vera*, making "nidos de las mariposas", at Larcs (160-22 det. W. Schaus), at Cayey (386-22), common on host throughout the coffee districts.

Pococera atramentalis Lederer
(as *Philotricha erigens* Ragonot) Möschler. Gundlach.
Van Z. (1226) on mango and (1626) on *Clerodendrum squamatum*.
3036), at Bayamón (I No. 3371, 3372).

Pococera insularella Ragonot
Möschler. Gundlach.

Jocara ragonoti Möschler (as **Deuterollyta**) 89-280, TYPE from Porto Rico.
(as *Deuterollyta*) Gundlach 91-530, No. 431.

Jocara majuscula Herr. Sch.
(as *Deuterollyta infectalis* Möschler 89-279, TYPE from Porto Rico) Gundlach 91-530, No. 430.

Stericta alnotha Schaus, Wm., Proc. Ent. Soc. Washington, Vol. 24, No. 9, p. 239, 1922: TYPE from Porto Rico.

CHRYSAUGINÆ

Tamyra albomaculalis Möschler 89-278, TYPE from Porto Rico.
Gundlach.

Pachymorphus subductellus Möschler 89-324, TYPE from Porto Rico.
Gundlach.

at light (284-22), at Bayamón (I No. 2916); larvae boring in twigs of roble, *Tecoma pentaphylla* (426-12 det. W. Schaus).

Carcha herselialis Walker
(as *Coeloma tortricalis* Möschler 89-277, TYPE from Porto Rico) Gundlach.
at light at Bayamón (I No. 2634, 2635, 2636).

Ethnistis munitalis Lederer
Möschler. Gundlach.
larvae in seed pods of roble, *Tecoma pentaphylla* (889-16 det. Schaus, 328-21 det. Dyar).

Callasopia rosealis Möschler 89-275, TYPE from Porto Rico.
Gundlach.

"Probably a synonym of *Caphys bilinea* Walker." W. Schaus.

Stretopalpia minusculalis Möschler (as **Tamyra**) 89-278, TYPE from Porto Rico.
(as *Tamyra*) Gundlach.

(Unabeled specimens det. W. Schaus as *S. deera* Druce), at light at Bayamón (I No. 2753, 2791, 9138, 5423).

Ballonicha recurvata Möschler
Möschler. Gundlach 91-509, No. 341.

PYRALINÆ

Pyralis manihotalis Guenee
(as *Parasopia dissimilalis* Möschler 89-276, TYPE from Porto Rico) Gundlach.
(I No. 5314); larvae feeding on rice (252-17, 22-16), on corn meal and rice (614-17 det. R. T. Cotton).

Pyralis (Asopia) gerontesalis Walker
Möschler. Gundlach.

SCIOENORINIÆ

Scirpophaga albinella Cramer
(as *S. leucalca* Zeller) Möschler. Gundlach.
(as *Rupella*) Van Z. (P. R. 1410).
common at light at Guánica (600-13 det. H. G. Dyar), at
Mayagüez (I No. 4986) at Bayamón (I No. 3336, 5531).

Scirpophaga longicornis Möschler 89-321, TYPE from Porto Rico.
Gundlach.
at light (1215-13 det. W. Schaus).

Rupella leucatea Zeller—det. W. Schaus
(I No. 932).

CRAMBINÆ

Crambus detomatellus Möschler 89-322, TYPE from Porto Rico.
Gundlach.

Crambus discludellus Möschler 89-323, TYPE from Porto Rico.
Gundlach.

Crambus fissiradiellus Walker—det. W. Schaus
(Unabeled specimens), at light at Bayamón. (I No. 2314
Leonard 33-136); resting eggplant leaf at Juncos (I No.
1781).

Crambus gestatellus Möschler 89-323, TYPE from Porto Rico.
Gundlach.

Crambus hastiferellus Zeller
(as *C. quinquareatus* Zeller) Möschler. Gundlach.
resting on sugar cane at Manatí (103-21 det. Dyar)

Crambus ligonellus Zeller
Möschler. Gundlach.
(Unabeled specimens—det. W. Schaus), at light (I No.
5593), at Bayamón (I No. 2311 Leonard 33-130, 2314).

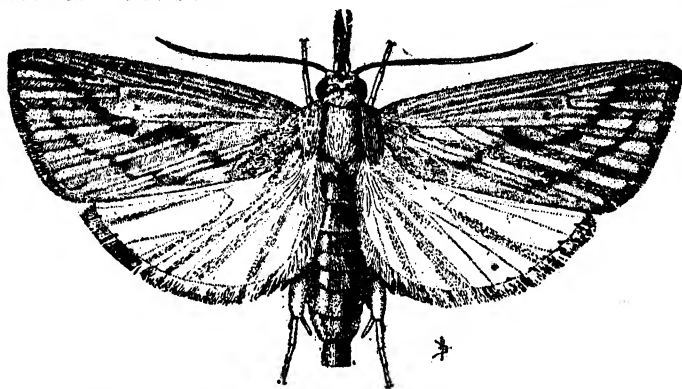
Argyria diplomachialis Dyar—det. W. Schaus
on weeds and at light (833-16), at Bayamón (I No. 2078),
at Utuado (W. A. Hoffman); resting on guava at Corozal
(I No. 2060 Leonard 33-117), on cucumber leaf at Loíza (I
No. 2030 Leonard 33-114).

Argyria lacteella F.—det. W. Schaus
at light at Bayamón (I No. 2308 Leonard 33-131); resting
on pineapple at Corozal (I No. 3785), on lima bean at Loíza
(I No. 1978).

Argyria opposita Zeller—det. W. Schaus
adults at light (I No. 923), resting on eggplant leaves at
Juncos (I No. 1771 Leonard 33-115).

Argyria lusella Zeller
Möschler. Gundlach.

Argyria nivalis Drury
Möschler. Gundlach.



Diatraea saccharalis F. Twice natural size. (After Holloway & Loftin.)

***Diatraea saccharalis* Fabricius**

(as *Diatraea obliterattella* Zeller) Möschler. Gundlach.

Busck 00-89: the larvae boring in stalks of sugar cane. "The annual cutting and crushing the cane with all living larvae and pupae naturally keeps the pest in check, but the remaining roots and single canes always contain enough individuals to infest the next year's growth."

May 06-10: recommends that "seed-cane be soaked twenty-four hours before planting to destroy (the larvae)."

Tower 07-28: the same recommendation.

Van Dine 11-45: an extent preliminary account.

Van Dine, D. L., "Damage to Sugar Cane Juice by the Moth Stalk-Borer (*Diatraea saccharalis* Fabr.)." Circ. No. 1, Expt. Station P. R. S. P. A., Río Piedras, 1912, pp. 1-11.

Van Dine 12-16: additional notes.

In lists of insects pests of sugar cane by Van Dine 13-251, Van Dine 13-28 and Smyth 19-144.

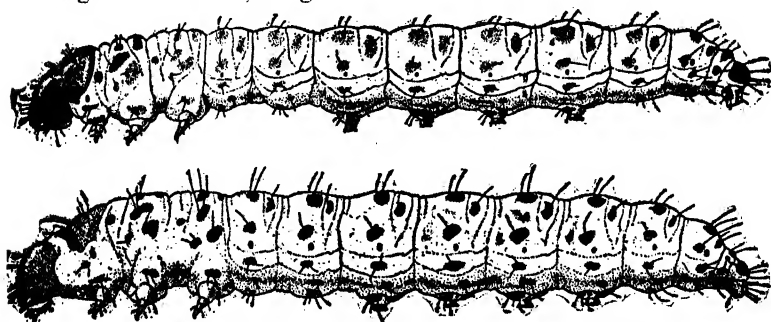
Van Z. (303) on sugar cane, corn, Guinea grass and gramma grass.

Jones, Thos H., "The Sugar-Cane Moth Stalk-Borer (*Diatraea saccharalis* Fabr.)." Bull. 12, Expt. Station, Bd. Comm. Agr., P. R., Río Piedras, March 16, 1915, pp. 1-30, figs. 8: an extended account, description of stages, life-history and parasites.

Johnston 15-24: as host of *Cordyceps barberi*.

Wolcott, G. N., "Influence of Rainfall and Burning the Trash on the Abundance of *Diatraea saccharalis*." Circ. 7, Insular Experiment Station, Río Piedras, 1915, pp. 1-6, map.

- Wolcott 17-80: a continuation of the observations reported in Circ. No. 7, with map.
- Stevenson 18-218: as host of *Isaria (Cordyceps) barberi* Giard.
- Cotton 18-290: a pest of corn. Illustration of pupa and adult.
- Colon 19-40: a summary of the work on *Diatraea* at the Insular Station to date.
- Wolcott 21-36: notes.
- Wolcott, G. N., "The Influence of the Variety of Sugar Cane on Its Infestation by *Diatraea saccharalis* Fabr., and the Other Factors Affecting the Abundance of the Moth Borer." Jour. Dept. Agr. P. R., Vol. 6, No. 1, Jan. (October) 1922, pp. 21-31: illustrations of *Trichogramma minutum* Riley and *Prophanurus alecto* Crawford, the parasites of the eggs in Porto Rico.
- Wolcott 23-55: unsuccessful use of larvae as vectors in transmission of gumming disease of sugar cane.
- EEP-41, 19 to 24: economic accounts, as a pest of corn and of sugar-cane.
- Wolcott 24-17, 20, 23, 26, 31: eaten by *Anolis pulchellus*, *A. krugii*, *A. stratulus* and *A. cristatellus*.
- Wolcott 24-6: control by *Trichogramma*.
- Wolcott 24-91: plant cane more heavily infested than ratoon; fields of Yellow Caledonia averaged 19%, St. Croix 12(4) 64% infested.
- Wolcott, G. N., "Weather and Non-burning of Trash in Borer Control in Porto Rico." IV. International Congress of Entomology, Vol. 2, pp. 62-64, ref. 1. Ithaca, N. Y., August 1923.
- Box, H. E., "Report upon a Trip to Porto Rico, April-July 1924." pp. 22. S. Davison & Co., Ltd., Barbice, British Guiana, November 1924: observations on and parasites of, in P. R.
- Box, H. E., "Observations on *Lixophaga diatraeae* Townsend, a Tachinid Parasite of *Diatraea saccharalis* Fabr., in Porto Rico." Bur. Ent. Research, Vol. 19, Pt. 1, pp. 1-6, ref. 11, fig. 1. London, August 1928.



Larvae of *Diatraea saccharalis* F. Three times natural size.
(After Holloway & Loftin.)

- Box, H. E., "The Introduction of Braconid Parasites of *Diatraea saccharalis* Fabr., into Certain of the West Indian Islands." Bull. Ent. Research, Vol. 18, Pt. 4, pp. 365-370, fig. 2, pl. 1. London, May 1928.
- Sein 29-96: unsuccessful search for *Ipobracon grenadensis* Ashmed at Aguirre, introduced by H. Box and L. A. Catoni from Venezuela.
- Box, H. E., "The Crambine Genera *Diatraea* and *Xanthopherne* Lep., Pyral.)." Bull. Ent. Research, Vol. 22, pt. 1, pp. 1-50, fig. 5, pl. 5. London, March 1931: on p. 25, P. R. records, at "Aguirre, reared from larvae in sugar-cane, 1926 (H. E. Box), 1930 (H. T. Osborn)."
- Box, H. E., "The Food Plants of American *Diatraea* Species." p. 11. Port-of-Spain, Trinidad, 1935: on *Hymenachne amplexicaulis*, *Oryza sativa*, *Panicum barbinode*, *Panicum maximum*, *Pennisetum purpureum*, *Saccharum officinarum*, *Zea mays* in P. R.
- Earle 28-165 to 169: a practical account.
- May, D. W., "Germinating Sugar-Cane." Agr. Notes No. 38, pp. 2. (mimeographed) San Juan, April 1927: soaking in lime water for one day, water alone, or lime and magnesium, stimulated germination and killed borers.
- Leonard 31-115, 32-138 & 33-125: notes on infestation.
- Leonard, M. D. & Sefn, F., "Observations on Some Factors which may affect the Abundance of *Diatraea saccharalis* in Porto Rico." Proc. 4th Congress Int. Soc. Sugar Cane Technologists, Bull. No. 92, pp. 2. San Juan, March 1 to 16, 1932.
- Wolcott 32-409: unaffected by hurricane of San Ciprián.
- Wolcott, G. N., "On Methods of Determining Borer Abundance in Cane Fields." Proc. 4th Congress Int. Soc. Sugar Cane Technologists, Bull. No. 88, pp. 2. San Juan, March 1 to 16, 1932.
- Wolcott 33-267; decreased infestation due to non-burning of trash balanced by increased infestation due to planting of susceptible varieties.
- Wolcott, G. N., "The Extent to which the Practice of Not Burning Cane Trash has been adopted in Puerto Rico." Jour. Dept. Agr. P. R., Vol. 17, No. 3, pp. 197-198. San Juan, July 1933: Trash not burned in 84.7% of 304 fields observed April 3 to 5, 1933.
- EEWI-166 to 192 & 249 ; an extended account as a pest of sugar-cane, and of corn.
- at light (154-13, 452-13), at Arecibo (148-13), at Guánica (551-13 det. H. G. Dyar), at Luquillo (199-13) at Bayamón (I No. 2367, 2497, 3777); emerged thru 1½ inches of soil (967-13); larvae on sugar cane (165-11, 9-12 det. H. G. Dyar, 327-12, 264-13, 356-13, 421-13, 939-13, 96-A 18, 69-19, 109-21), at Arecibo (184-11), at Isabela (I No. 4172), at Santa Isabel (130-13), at Aguirre (26-11, 28-11), at Fajardo (70-24), at Luquillo (276-13), killed by *Cordyceps*

(*Isaria*) fungus at Guánica (45-10, 33-11). at Santa Isabel (184-12); larvae on corn (53-12 det. Dyar, 610-17, 631-17), at Barceloneta (I No. 3714), at Caguas (325-21); larvae on elephant grass at Humacao (682-18), on *Hymenachne amplexicaule* (934-13), on malojillo, *Panicum barbinode* (882-13, 909-13 det. Dyar), on grass and cane at Guánica (231-11, 171-13), at Patillas (175-12); eggs on rice at Comerío (940-13—adults reared on sugar cane, det. Dyar); pupae in stems of rice at Fajardo in June, 1935 and at Arecibo, July 1935 (GNW); larvae in sugar-cane on Mona Id. (F. Seín); on Guatemala grass (F. Seín).

Chalcoela discederalis Möschler 89-320, TYPE from Porto Rico. Gundlach.

(unlabeled adult—det W. Schaus), resting on grapefruit leaf at Manatí (I No. 4088).

GALLERINÆ

Galleria mellonella Linnaeus "Traza"

Möschler. Gundlach. Van Z. (1720).

at light at Bayamón (I No. 4222); abundant in bee hive at Lares (73-24).

Corcyra cephalonica Stainton

Chittenden, F. H., "The Rice Moth" Bull. 783, U. S. Dept. Agr., July 14, 1919, pp. 1-15: Porto Rican records of eggs laid in sacks of cereals, larvae abundant in rice and reared from chocolate.

EEP-129: attacking stored products.

larvae attacking dry garbanzos or chick peas (543-22 det. R. T. Cotton), cotton seed cake (I No. 2001), bean pods (I No. 1819), tamarind pods at Guánica (I No. 2809); adults at light at Bayamón (I No. 2869).

Achroria grisella F.—det. A. Busck

in bee comb (34-25).

PHYCITINÆ

Homalopalpia dalera Dyar—det. C. Heinrich

at light at Bayamón, (I No. 2867, 3323, 3375).

Acrobasis crasssquamea Hampson—det. C. Heinrich

at light at Bayamón (I No. 4671).

Hypsiphyla grandella Zeller—det. C. Heinrich

Leonard 32-128: a shoot borer in "cedro hembra", *Turpinia paniculata*.

Myelois ceratone Zeller—det. C. Heinrich

reared from larvae in tamarind pods at Trujillo Alto (I No. 2211 Leonard 33-127).

Myelois decolor Zeller—det. C. Heinrich
reared from algarrobo pods at Arecibo (I No. 2102).

Myelois furvidorsella Ragonot
Möschler. Gundlach.

Crocidomera fissuralis Walker
Möschler. Gundlach.

Crocidomera turbidella Zeller
Möschler. Gundlach.
(Unlabeled specimens—det. W. Schaus.)

Pempelia diffisella Zeller
Möschler. Gundlach.

Plodia interpunctella Hübner
EEP-129: a pest of stored products.
larvae in dry dates (108-21 det. J. D. More).



Etiella zinckenella Treitschke. Five times natural size. (Drawn by G. N. Wolcott.)

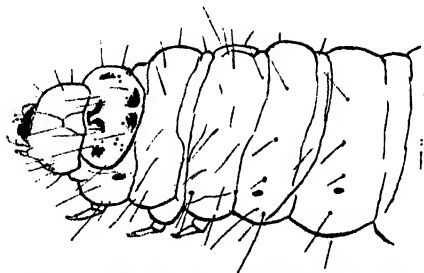
Etiella zinckenella Treitschke
Möschler. Gundlach.

Leonard & Mills 31-469 to 470: larvae in lima beans, pigeon peas, crotalaria and cowpeas; cocoons in the ground, pupal period of less than two weeks; parasitized by *Heterospilus etiellae* Rohwer and ? *Eurytoma* near *insularis* Ashmead.

Faxon & Trotter 32-445: found in bean pods.

Leonard 32-122, 131 & 33-102, 122: host and locality records; on Vieques Id.

Wolcott 33-47: common in lima bean pods in summer, practically disappearing in winter.



Forepart of larva of *Etiella zinckenella* Treit. Ten times natural size.
(Drawn by G. N. Wolcott.)

Wolcott 33-241 to 255; spraying experiments; larva differentiated from that of *Fundella*, summary also in Wolcott 34-96. EEWI-617 to 621: an illustrated, economic account.

Wolcott, G. N., "Lima Bean Pod-Borer Caterpillars of Puerto Rico on their Wild Hosts". Jour. Agr. P. R., Vol. 18, No. 3, pp. 429-434, ref. 2. San Juan, October 1934: caterpillars much more abundant in pods of *Crotalaria incana* on sandy beaches than in heavy clay soil; eggs described, hatching not affected by spraying with pyrethrum, but oviposition prevented in preliminary experiments.

twenty-seven interception records of larvae in pigeon peas, at Río Piedras, Cataño, Isabela. Aguadilla, Mayagüez, Utuado, San Antonio, Ponce, Peñuelas, Ensenada, Lajas and Arroyo; in lima beans at Bayamón (I No. 3674, 3716), at Isabela (136-31, I No. 2081, 2237, 2238, 3700), at Yauco (I No. 2016); in pods of *Crotalaria incana* at Isabela (56-33), at Mameyes (43-33).



Fundella cistipennis Dyar. Five times natural size. (Drawn by G. N. Wolcott.)

***Fundella cistipennis* Dyar**

(as *Pachyzancla bipunctalis* Fab.) Jones 15-8: attacking garden beans and sword beans, *Canavalia ensiformis*. Notes.

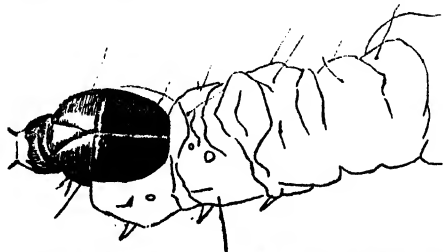
(as *Ballovía*) Cotton 18-292: the stalk and pod borer of cowpeas. Notes and illustration of adult.

Leonard & Mills 31-471: pupal period 8 to 12 days; adults at light at Cataño and on Vieques Id.

Faxon & Trotter 32-445: in bean pods.

Riollano 31-113: on Vieques Id.

Leonard 31-119 & 32-122, 131, 135: on cowpeas, pigeon peas, black-eyed peas, lima bean and sword bean.



Forepart of larva of *Fundella cistipennis* Dyar. Ten times natural size. (Drawn by G. N. Wolcott.)

Wolcott 33-47: the important commercial pest of lima beans.
 Wolcott 33-241 to 255: spraying experiments, larva differentiated from that of *Etiella*; summary also in Wolcott 34-96.
 EEWI-617 to 621: an illustrated economic account.

Wolcott 34-432 to 433; description of egg, found on *Canavalia maritima* and *Cassia occidentalis*, hatching not prevented on former by spraying with pyrethrum.

larvae boring in shoots of Uba cane at Villalba (75-24 det. H. G. Dyar, 709-17), at Isabela (175-31); of sword beans *Canavali ensiformis* (219-12, 875-14, 879-14, 880-14), at Isabela (157-31. I No. 1476); of beach beans, *Canavali maritima*, at Mameyes and Dorado (82-33), at Pt. Cangrejos (2-32), at Patillas (23-33); of *Cassia occidentalis* (881-14, 85-33; on peas at Manatí (I No. 1048); fifteen interception records in lima beans, at Isabela, Adjuntas, Arecibo, Vega Baja and Loíza.

Fundella pellucens Zeller

Möschler. Gundlach.

Piesmopoda columella Zeller

Möschler. Gundlach.

Piesmopoda rubicundella Zeller

Möschler. Gundlach.

Piesmopoda rufulella Ragonot

Möschler. Gundlach.

at light at Bayamón (I No. 2310, 4725), at Comerío (I No. 3209).

Cuba furculella Dyar

(Unlabeled specimens—det. W. Schaus.)

Salebria famula Zeller

Möschler. Gundlach.

Elasmopalpus rubedinellus Zeller

Möschler. Gundlach.

Dozier 26-117: notes. EEWI-194: a pest of sugar-cane.

larvae boring in stalks and stems of cowpeas (66-12 det. W. Schaus).

Elasmopalpus lignosellus Zeller

Möschler. Gundlach.

abundant flying over land just plowed at Maunabo (541-12 det. W. Schaus).

Oligochroa pellucidella Ragonot

Möschler. Gundlach.

Laetilia portoricensis Dyar, H. G., TYPE from Porto Rico.
larvae feeding on scale insects, *Saissetia oleae* on Africa tulip tree (I No. 1164); on *Lecanium* sp., pigeon pea at Mayeyes (995-13 det. H. G. Dyar, TYPE); larvae on withered stems of *Eupatorium odoratum* (896-16 det. W. Schaus); adult at light at Bayamón (I No. 2948).

Onocolabis anticella Zeller
Möschler. Gundlach.

Homoesoma maturella Zeller
Möschler. Gundlach.

Homoesoma exiguella Ragonot
Möschler. Gundlach.

HYBLAEIDÆ

Hyblaea puera Cramer
Stahl. Möschler. Gundlach. Van Z. (P. R. 124).
Forbes 30-73 & 31-345: at Lares.
adult in grapefruit grove at Barceloneta (I No. 3660), at light (587-22, I No. 3359, 4322); larvae feeding on leaves of roble trees, *Tecoma pentaphylla* (199-17 det. W. Schaus), in great abundance at Guaynabo (586-22), at Comerío (388-22); larvae feeding on leaves of African tulip tree, *Spathodea campanulata*, at Lares (71-24, 92-24), at Florida (180-32).

THYRIDIDÆ

Rhodoneura myrsuaslis Walker
(as *Strigilina scallula* Guenee var. *immaculata* subsp. nov.)
Möschler 89-122: TYPE from P. R. Gundlach 91-456 (No. 149).
Forbes 30-74.

PTEROPHORIDÆ

Pterophorus basalis Möschler (as *Oedematophorina*) 89-345, TYPE from Porto Rico.
Gundlach. Forbes 30-77. Forbes 31-245: at Lares.

Pterophorus inquinatus Zeller
Forbes 31-345: at Coamo Springs.

Pterophorus paleaceus Zeller
Möschler. Gundlach.

Pterophorus sp.—det. Busck.
larva on *Ipomoea rubra* (892-16).

Adaina bipunctata Möschler (as *Pterophorus*) 89-346, TYPE from Porto Rico.
Gundlach. Forbes 30-75. Forbes 31-345: at Santurce, Dorado, Coamo, El Yunque and on Vieques Id.
at light at Bayamón (I No 5339); larva on *Pluchea purpurascens* (I No. 5512).

Adaina participata Möschler (as **Pterophorus**) 89-346, TYPE from Porto Rico.
Gundlach.

Forbes 31-345: at Coamo Springs, Lares and on Vieques Id.
at light at Bayamón (I No. 2950).

Adaina praeusta Möschler (as **Pterophorus**) 89-346, TYPE from Porto Rico.

Gundlach. Forbes 30-75: at Bayamón.

Ochyrotica fasciata Walsingham—det. A. Busck
resting on guava leaf at Barceloneta (I No. 4022).

Marasmarcha pumilio Zeller

Forbes 30-78: at Naranjito.

Forbes 31-345: at San Germán, Coamo Springs, Cataño and on Vieques Id.

Trichoptilus defectalis Walker

Forbes 30-78: larva on *Boerhaavia repens* and *Amaranthus*; at Ensenada, Guayanilla and Coamo Springs.

Forbes 31-345: at Aguirre and on Vieques Id.

Sphenarches caffer Zeller

Forbes 30-79: at Río Piedras; at San Juan on pigeon pea (Trotter & Fox).

Platyptilia crenulata Barnes & McDunnough

Forbes 31-346: at Coamo Springs.

Platyptilia pusillidactyla Walker

IP-201: larvae on *Caperonia palustris* (390-16, 313-16), on *Caperonia regalis* (577-12 as *Oxyptilus* sp. det. A. Busck).

Forbes 30-80. Forbes 31-346: at Coamo Springs
on artichoke (I No. 2911).

ORNEODIDÆ

Orneodes eudactyla Felder

(as *Alucita*) Möschler. Gundlach. IP-201.

Forbes 30-80 & 31-346: at Coamo Springs.

TORTRICIDÆ

Apinoglossa comburana Möschler 89-331: TYPE from P. R.

Gundlach. IP-201. Forbes 30-83.

Archips jamaicana Walker ?

(as sp.—det. E. G. Smyth) IP-201: larvae on *Spondias lutes* (880-16), on *Malachra rotundifolia* (901-16).

Forbes 30-83 & 31-346: ? determination of above.

Paratorna rotundipennis Walsingham

Forbes 30-83 & 31-346: at Boquerón.

numerous larvae, tying the leaves together and almost defoliating a small tree of Hawaiian algarroba at Boquerón (315-23 det. W. T. M. Forbes).

Coelostathma parallelana Walsingham

Forbes 30-84: at Naguabo.

Forbes 31-346: at Lares and El Yunque.

at light (I No. 2772), at Bayamón (I No. 4667).

Drachmobola insignitana Möschler (as **Tortrix**) 89-330: TYPE from P. R.

(as *Tortrix*) Gundlach. IP-201.

Forbes 30-84: at Aibonito.

Forbes 31-346: redescribed; at Jájome Alto and on El Yunque.

Sparganothis effoetana Möschler (as **Tortrix**) 89-330: TYPE from P. R.

(as *Tortrix*) Gundlach. IP-201.

Forbes 30-84: no collection since type.

Platinota rostrana Walker—det. A. Busek

(as *Sparganothis flavedana* Clemens). Forbes 30-85: at Coamo Springs and Lares.

Forbes 31-347: at Lares.

reared from "molinillo" at Pueblo Viejo (I No. 5270-C);

larva on rose (I No. 2477).

Sparganothis saturatana Walker

Forbes 31-347: at Coamo Springs.

EUCOSMINÆ (OLETHREUTINÆ)

Olethreutes albimaculana Walsingham—det. A. Busek

at light at Bayamón (I No. 3377).

Olethreutes anthracana Forbes 31-347, fig. 2: TYPE from El Yunque, P. R.

Olethreutes canofascia Forbes 30-86: TYPE from Río Piedras, another from Manatí, P. R.

(as *Olethreutes* sp. near *malachitana* Zeller—det. H. G. Dyar) IP-201: larvae light olive green, head light brown, webs together leaflets of *Phyllanthus lathyroides* (978-13, 288-16, 393-16).

(393-16 TYPE); adults at light at Bayamón (I No. 2951 as *Cacocharis* det. C. Heinrich).

Olethreutes hebesana Walker

Forbes 30-88 & 31-347: at Coamo Springs and on Vieques Id.

Olethreutes sp.—det. C. Heinrich

reared from guava at Corozal (I No. 2191-B).

Gymnandrosoma desotatum Heinrich
Forbes 31-349: from Vieques Id.

Gymnandrosoma trachycerus Forbes 31-349, fig. 1: TYPE from
El Yunque, P. R.

Gymnandrosoma sp.
on *Brysonia spicata* fruit at Maricao (I No. 4996).

Bactra verutana Zeller
Forbes 31-350: at San Juan, Cataño, Coamo Springs, San
Germán, Aguirre and on Vieques Id.

Episimus argutatus Clemens
Forbes 31-350: from Vieques Id.
on orange at Pueblo Viejo (I No. 2831).

Episimus sp. (? *guiana* Busck?) det. A. Busck
resting on squash at Bayamón (I No. 3278).

Anchyloptera virididorsana Möschler (as **Phoxopteria**) 89-334:
TYPE from P. R.
(as *Phoxopteria*) Gundlach.
Forbes 30-89 & 31-350: at San Germán and from Vieques Id.

Thiodia autochthones Walsingham
Forbes 31-350: at Cataño, Aguirre and San Germán.

Eucosma longipalpata Möschler (as **Grapholitha**) 89-333: TYPE
from P. R.
(as *Grapholitha*) Gundlach.
Forbes 30-90: generic transfer.

Eucosma strenuana Walker
Forbes 30-90 & 31-350: at Coamo Springs, Aguirre, Isabela
and from Vieques Id.

Crociosema plebeiana Zeller
Forbes 30-91: at Bayamón and from Culebra Id.
Forbes 31-350: many P. R. localities and from Vieques Id.
"Common everywhere."
at light at Utuado (W. A. Hoffman).

Strepsicrates smithianus Walker
Forbes 30-91: at Naguabo. Forbes 31-351: from El Yunque.
reared from *Psidium guajava* (870-16 det. A. Busck).

Heligmocera calvifrons Walsingham
Forbes 30-92 & 31-351: from El Yunque.

Balbis excitana Möschler (as **Grapholitha**) 89-333: TYPE from P. R.
(as *Grapholitha*) Gundlach.
Forbes 30-93: generic transfer.

Epinotia unica Heinrich
Forbes 31-351: at Isabela.

PHALONIIDÆ

Saphenista bunteoides Forbes 31-353 fig. 3: TYPE from Coamo Springs, P. R.

at light at Utuado (W. A. Hoffman).

Saphenista lepidulana Forbes 31-354, fig. 4: TYPE from Coamo Springs, others from El Yunque, P. R. and Vieques Id.

Saphenista multistrigata Walsingham-Durrant

Forbes 31-354: at Coamo Springs, Jájome Alto and El Yunque.

Saphenista semistrigata Forbes 31-355 fig. 5: TYPE from El Yunque, others from Coamo Springs, P. R.

reared by A. S. Mills from *Pluchea purpurascens* (I No. 5513, 5553).

Saphenista sp. nov. Forbes 31-355: from El Yunque.

Phalonia distingmatana Walsingham

Forbes 30-96: at Bayamón. Forbes 31-355: at Isabela.

Phalonia prolectana Möschler (as *Cochylis*) 98-332: TYPE from P. R. (as *Cochylis*) Gundlach.

Forbes 30-94: generic transfer.

Phalonia subolivacea Walsingham

(as sp.—det. A. Busek) 1P-201: larvae boring in flower heads of *Erechtites hieracifolia* (332-16).

Forbes 30-95: at Bayamón, Naguabo and Arecibo.

Forbes 31-355: at Cataño, Coamo Springs, Aguirre, Isabela, El Yunque and on Vieques Id.

larvae boring in flower heads of *Bidens pilosa* at Dorado (I No. 5002), at Guayama (I No. 5038).

Phalonia tectoniana Möschler (as *Cochylis*) 89-332: TYPE from P. R.

(as *Cochylis*) Gundlach.

Forbes 30-95: generic transfer.

Phalonia vicintana Möschler (as *Cochylis*) 89-333: TYPE from P. R. (as *Cochylis*) Gundlach.

Forbes 30-96: generic transfer.

Phalonia sp. nov. Forbes 31-355: from El Yunque.

Commophila sp.—det. A. Busek

larvae boring in buds of *Dahlia*, causing them to wither (210-22).

COSSIDÆ

Psychonoctua personalis Grote

Hooker 13-35: "a lepidopterous borer, determined by Dr. H. G. Dyar as *Psychonoctua* sp., which was reported by Tower (08-27) as boring in orange, citron, rose-apple and sweet almond, has done considerable damage, where the trunks and larger branches of the coffee plants are riddled with canals."

Van Zwaluwenburg 17-516: tentatively determined by Dr. Dyar as *P. jamaicensis* Schs., "most often found in old coffee at altitudes up to 1,500 ft., pruning and burning invaded wood" as control.

(as *Psychonoctua* sp. nov. det. W. Schaus.) IP-200: in coffee grove in mountains north of Yauco (245-22); larvae in coffee at Villalba (359-21), at Lares (55-22).

EEP-57 & (as *Xyleutes muricolor* Dyar MS—det. W. Schaus)

EEW1: economic, illustrated accounts as a pest of coffee.



Larva of *Psychonoctua personalis* Grote in its tunnel in the coffee trunk.
Natural size. (Drawn by F. Señín.)

Forbes 30-97 & 31-355: at six P. R. localities and on Vieques Id. Leonard 32-128: adult at light.

Leonard 33-118: larvae in mangrove at Pt. Cangrejos.

adult at light in Miramar (41-24); larvae very abundant in coffee at Aguadilla (159-31 det. W. Schaus as *Xyleutes muricolor* Dyar (MS). Male Genitalia slides unite *P. personalis* Grote, *Jamaicensis* Schaus and the Porto Rican race), at Mayagüez, in vega land under *Gliricidia* shade (41-34), at Quebradillas (GNW), at Vega Baja (23-35), in Croton (GNW).

YPONMEUTIDÆ

Urodus sordidata Zeller

(as *Trichostibas*) IP-204: Busck.

Forbes 30-98: Zeller.

Yponmeuta triangularis Möschler 89-339: TYPE from P. R.

Gundlach. Forbes 30-99.

larvae making nests between leaves of *Elaeodendron xylocarpum* at Boquerón (112-23 det. A. Busck), at Pt. Salinas (GNW). The fully-grown larva is 14 mm. long, with an orange-yellow head. Body, canary-yellow, an irregular medio-dorsal black spot on each abdominal segment, laterally bordered with white, lateral of which is a much larger irregular black, grey-bordered spot. On the 2nd and 3d thoracic segments, these large lateral spots are broken in two by median white bands; on the 1st segment are two black crescents only. True legs black, spiracles black, lateral hairs with black areas at base, prolegs black and white banded.

Euarne obligatella Möschler 89-340: TYPE from P. R.
Gundlach. Forbes 30-100.

Plutella maculipennis Curtis

(as *Plutella xylostella* L.) Möschler. Gundlach.

Barrett 04-448: on cabbage.

Tower 08-35: on cabbage, kale, mustard and turnips. Notes and control.

Jones 15-9: notes, illustration of injured mustard leaf.

Cotton 18-281: notes, illustrations of all stages: "the worst insect pest of cabbages in Porto Rico."

EEP-111: a pest of cabbages.

Forbes 30-100 & 31-356: at Coamo Springs and Isabela.

at light (343-16, I No. 5594); larvae on cabbage (193-12, 194-12, 420-16, I No. 1269, 1283, 2050), at Bayamón (I No. 5028), at Arceibo (159-19); on broccolli at Villalba (I No. 3090).

GLYPHPTERYGIDÆ

Tortyra aurofasciata Snellen

(as *Choregia*) Möschler. Gundlach.

(as *T. auriferalis* Walker ?—det. A. Busck) IP-205.

Forbes 30-102: at Guánica and Guayanilla.

Forbes 31-356: from Vieques Id.

Brenthia pavonacella Clemens

Möschler. Gundlach. Forbes 30-102: at Mayagüez.

at light (I No. 5067), at Bayamón (I No. 2747, 3380, 4348), abundant in coffee grove (431-21 det. C. Heinrich "feeds on *Amphicarpaea*"), at Yauco, Adjuntas and Utuado (255-22), resting on morning glory (887-16); larvae abundant, feeding on underside of leaves of *Inga vera* at Lares, November 1931. (F. Sein Leonard 33-117).

HELIODINIDÆ

Heliodines quinqueguttata Walsingham

Forbes 31-356: at Dorado and Aguirre.

at light at Bayamón (I No. 2760, 3010—det. A. Busck); in grapefruit grove at Añasco (I No. 4160).

COSMOPTERYGIDÆ

Batrachedra albistrigella Möschler 89-345: TYPE from P. R.
Gundlach. Forbes 30-107.

Comopteryx antillia Forbes 31-356, fig. 6: TYPE from Coamo Springs, P. R.

(as *C. mimetis* Meyrick) Forbes 30-108: at Coamo Springs.

Cosmopteryx attenuatella Walker

IP-204: Busck. Forbes 30-107: at Coamo Springs.

at light (I No. 4999).

Cosmopteryx gemmiferella Clemens

Möschler. Gundlach.

Cosmopteryx sancti-vicenti Walsingham

Forbes 30-108 & 31-357: at Coamo Springs and on El Yunque.

Cosmopteryx similis Walsingham

Forbes 30-108 & 31-357: at Coamo Springs and from Vieques Id.

Pyroderces rileyi Walsingham—det. J. D. More

IP-204: larvae in old cotton bolls at Arecibo (340-21, 552-21), at Vega Baja (360-21), at Villalba (554-21), at Maunabo (530-22).

Forbes 30-108 & 31-357: at Aguirre and from Vieques Id.

in old cotton bolls at Morovis (511-23), at Isabela (109-32), at Río Piedras (4-30 det. W. T. M. Forbes Leonard 32-131), at Aguadilla (I No. 484), at Vega Alta (I No. 1109), at Ponce (I No. 3946); in old cowpeas on Vieques Id. (I No. 1285 Leonard 32-131).

Homaledra sabalella Chambers—det. A. Busck

IP-204: larvae common on leaves of coconut palm (320-19, 69-23 det. A. Busck); on fronds of *Livistona* palm (GNW), eating the lower side of the leaf and webbing together their excrement for a shelter, at times so common as to cause the leaves to turn brown. On coconut palms at Pt. Cangrejos, Manatí, Mayagüez, Naguabo and on Vieques Id. (GNW).

EEP-78: on coconut and ornamental palms.

Forbes 30-109.

EEWI-365: two parasites, control with nicotine sulfate.

on cohoun palm at Río Piedras (GNW); on native mountain palm on El Yunque (12-34).

Prochola fuscula Forbes 31-357, fig. 7: TYPE from Vieques Id., other from Coamo Springs, P. R.

Perimede annulata Busck ?

Forbes 31-358: at Cataño.

Perimede purpurescens Forbes 31-358, fig. 9: TYPE from Lares, P. R.

Eriphia curvipunctella Walsingham

(as *Eritarbes*) Forbes 30-110: at Mayagüez.

Forbes 31-360: at Santurce, Coamo Springs, Isabela and on Vieques Id.

Eriphia pernigrella Forbes 31-360: TYPE from Vieques Id.

Eriphia quinquepunctata Forbes 31-360: TYPE from Vieques Id., others from Coamo Springs, P. R.

Stilbosis phaeoptera Forbes 31-361, fig. 8: TYPE from Coamo Springs, another from El Yunque, P. R.

Aphanosara planistes Forbes 31-362, fig. 10: TYPE from El Yunque, P. R.

BLASTOBASIDÆ

Blastobasis argillacea Walsingham

Forbes 30-112: at Fajardo and Guayama.

Forbes 31-363: at Santurce, Coamo Springs and from Vieques Id.

Blastobasis subolivacea Walsingham

Forbes 31-363: at Coamo Springs, Aguirre and from Vieques Id.

Auximobasis constans Walsingham

Forbes 31-363: from Vieques Id.

Auximobasis flaviciliata Walsingham

Forbes 31-363: from Vieques Id.

Auximobasis insularis Walsingham

Forbes 31-363: from Vieques Id.

Auximobasis variolata Walsingham

Forbes 30-113: on Culebra Id.

Forbes 31-363: at Coamo Springs and from Vieques Id.

Pigritia sp. (**P. ochrocomella** ?)

Forbes 31-363: at Coamo Springs, Lares and Palmas Abajo.

GELECHIIDÆ

Oecia oecophila Staudinger

Forbes 30-115: at Río Piedras (J. D. More); "Found on house walls with the similar *Tineola uterella*."

from refuse (503-23 det. A. Busck as *O. maculata* Walsingham) in cockroach jar—the specimen on which Forbes' record is based.

Sitotroga cerealella Olivier—det. R. T. Cotton

EEP-128: as a pest of stored products. Forbes 30-116.

larvae in corn (615-17), at Vega Baja (440-21); adult on weeds at Cidra (I No. 4287)

Tholerostola evippella Forbes 31-364, fig. 11: TYPE from Isabela, others from San Germán and Coamo Springs, P. R.

Aristotelia absconditella Walker

Forbes 31-367: at Coamo Springs.

Aristotelia diolcella Forbes 31-366, fig. 13: TYPE from Vieques Id., others from Coamo Springs, San Germán and Palmas Abajo, P. R.

Forbes, W. T. M., "The Rubidella Group of *Aristotelia* (Lepidoptera, Gelechiidae)." Jour. N. Y. Ent. Soc., Vol. 40, pp. 423-433, pl. 1. New York, December 1932: on p. 427, from P. R.

Aristotelia lignicolora Forbes 31-368, fig. 14: TYPE from Coamo Springs, P. R.

Aristotelia picticornis Walsingham
Forbes 31-368: at Coamo Springs.

Aristotelia penicillata Walsingham
Forbes 31-369: at Coamo Springs and Isabela.

Aristotelia vagabundella Forbes 31-365, fig. 12: TYPE from Vieques Id., others from Isabela. Coamo Springs and Aguirre, P. R.
Forbes 32-429: from P. R.

Glaucacna iridea Forbes 31-369, fig. 15: TYPE from El Yunque, P. R.

Empedaula rhodocosma Meyrick
Forbes 31-370: at Coamo Springs and San Germán.

Epitheatia annulicornis Walsingham
Forbes 30-119: from Culebra Id.
Forbes 31-371: at Coamo Springs and from Vieques Id.
at Cidra (I No. 1661 as near).

Epitheatia eromene Walsingham
Forbes 31-370: at Santurce. Coamo Springs, Aguirre and from Vieques Id.

Epitheatia kittella Walsingham ?
Forbes 31-371: from El Yunque.

Schistophila fuscella Forbes 31-371: TYPE from El Yunque, P. R.

Telphusa distictella Forbes 31-372: TYPE from San Germán, P. R.

Telphusa perspicua Walsingham
Forbes 31-372: at Coamo Springs and from Vieques Id.

Trichotaphe (Cymotricha) pectinella Forbes 31-372: TYPE from Coamo Springs, P. R.

Trichotaphe (Onebala) elliptica Forbes 31-373, fig. 19: TYPE from Vieques Id.

Trichotaphe (Onebala) melissia Walsingham
Forbes 31-373: at Río Piedras and on El Yunque.

Trichotaphe sp. nov.—det. A. Busck
IP-202: a small grey moth with thick orange antennae, a large black spot near base of forewings; larva a leaf-roller on *Inga vera* (75-23).

Trichotaphe manella Möschler (as *Ypsolophus*) 89-344: TYPE from P. R.
(as *Ipsolophus*) Gundlach. (as *Dichomeris*) IP-202.
Forbes 30-121: generic transfer.
resting on pomarrosa at Barceloneta (I No. 2074 Leonard 33-135).

Eunebristis zingarella Walsingham

(as *Dichomeris*) IP-202: reared by Mr. Busek from *Coccoloba*, San Juan, February 1899. Wolcott 26-50: on sea-grape.

Forbes 30-120: "Larva a leaf-miner, abundant."

reared from round mines in sea-grape leaves at Mameyes (7-36 det. W. T. M. Forbes).

Dichomeris indignus Walsingham

Forbes 31-374: at Coamo Springs, Jácome Alto and on El Yunque.

Dichomeris piperatus Walsingham

Forbes 30-121 & 31-374: larva a leaf-tyer on alfalfa, at Isabela, April 1930, reared by F. Seín; at Santurce, Cataño, Coamo Springs and from Vieques Id.

Seín, F., "Insectos que atacan la Alfalfa en Puerto Rico." Rev. Agr. P. R., Vol. 25, No. 2, p. 91. San Juan, 1930.

Seín, F., "*Dichomeris piperatus* Walsingham, a Pest of Alfalfa in Puerto Rico." Jour. Ec. Ent., Vol. 23, No. 5, pp. 885-886. Geneva, N. Y., October 1930.

(as sp.) Danforth 26-100: eaten by Yellow-Shouldered Blackbird.

larvae on alfalfa at Isabela (1-30 Leonard 31-119); at light at Bayamón (No. 2790).

Thiotricha sciurella Walsingham

Forbes 30-122 & 31-374: from Vieques Id.

Polyhymno luteostrigella Chambers

Forbes 31-374: at Río Piedras, Cataño, Isabela and on Vieques Id.

at light at Bayamón (1 No. 2649), at Comerío (1 No. 3210).

Brachyacma palpigera Walsingham

Forbes 31-374: at Coamo Springs and from Vieques Id.

Leonard & Mills 31-472: larvae in dry pigeon pea pods at Río Piedras, Bayamón, Vega Alta, Vega Baja and Cabo Rojo, and in dry *Crotalaria* pods at Pueblo Viejo and Bayamón; often over 50% parasitized by *Paralitomastix* sp. nov. det. A. B. Gahan.

Leonard 32-131, 136: the above data.

larva in pod of *Crotalaria incana* at Loíza (81-33); adults at light (1 No. 4998), at Bayamón (1 No. 2318, 2786, 3746).

Anacampsis (Commatica) bifuscella Forbes 31-375: TYPE from Coamo Springs, others at San Germán, Isabela and El Yunque, P. R.

Anacampsis (Anacampsis) insularis Walsingham

Forbes 31-375: on El Yunque.

Anacampsis (A.) spp. nov. Forbes 31-375: from Santurce and San Germán.

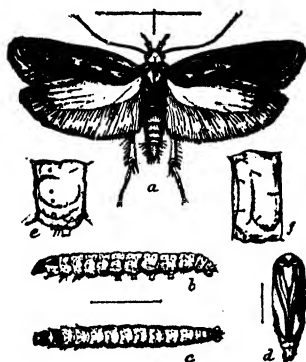
Anacampsis (Compsolechia) melanophaea Forbes 31-376, fig. 16:
TYPE from El Yunque, another from Coamo Springs, P. R.

Anacampsis (Compsolechia) meibomiella Forbes 31-376, fig. 17:
TYPE from Santiago, others from San Germán, P. R.

Anacampsis (C.) mangelivora Walsingham ?
Forbes 31-377: from El Yunque.

Anacampsis (C.) plumbeolata Walsingham
Forbes 31-377: at Coamo Springs.

Phthorimaea striatella Murteldt
Forbes 30-127: at Fajardo; larva in berries of *Solanum*.
Forbes 31-377: at Cataño.



Phthorimaea operculella Zeller:
a, adult, b & c, larvae, d,
pupa. (U. S. Dept. Agr.)

***Phthorimaea operculella* Zeller**

(as *Gelechia picipella*) Barrett 05-396: "slight damage to tobacco at Aguas Buenas."

Cotton 18-299: attacking eggplant. Notes and control.

Wolcott 21-49: attacking tobacco.

Wolcott 22c-11: as "candela o candelilla", a pest of tobacco.
Notes and control. Colored illustration of injury.

Wolcott 23-47: rainfall an important factor in control.

IP-202: larvae mining in leaves of eggplant (544-17, 567-17, 581-17, 591-17); in leaves of tobacco at Rincón (15-21), at Manatí, Arecibo, San Germán and Yauco (GNW).

Wolcott 24-55: most serious in dry sections.

EEP-91 & EEWI-571 to 574 & 585 to 586: illustrated, economic accounts, as a pest of tobacco, and of Irish potatoes.

Torres 29-241: on Irish potatoes.

Señ, F., "Nuevas Cosechas, Nuevas Plagas." Rev. Agr. P. R., Vol. 23, No. 2. pp. 84-86. San Juan, 1929: attacking Irish potatoes.



Injury to young tobacco plant caused
by *Phthorimaea operculella* Zeller.
(Drawn by F. Sefn.)

Forbes 30-127: at Río Piedras and San Germán.

Forbes 31-317: at San Germán, Isabela, Coamo Springs, Já-jome Alto and on Vieques Id.

Leonard 32-140: abundance on tobacco due to dry weather, at Río Piedras, Caguas and Cayey.
in Irish potato tubers (2-29).

Gelechia exclarella Möschler 89-343: TYPE from P. R. Gundlach. Forbes 30-127.

Gelechia salva Meyrick

Forbes 31-377: at Coamo Springs and San Germán.

Stegasta bosquella Chambers var. **costipunctella** Möschler
(as *Gelechia costipunctella* sp. nov.) Möschler 89-344: TYPE from P. R. Gundlach. IP-202: = *G. bosquella* Chambers.

Forbes 30-128: synonymy.

Forbes 31-377: re-description; from San Germán and Vieques Id.

at light at Bayamón (I No. 3178).

Stegasta capitella F.

(as *Gelechia rivulella* sp. nov.) Möschler 89-344: TYPE from P. R. Gundlach. IP-202.

Forbes 30-129: at Coamo Springs and on Culebra Id.

Forbes 31-377: "A common species"; at seven P. R. localities and from Vieques Id.

Pectinophora gossypiella Saunders—det. J. D. More, confirmed C. Heinrich

Wolcott, G. N., More, J. D., & Seín, F. Jr., "La Oruga Rosada de la Cápsula del Algodón en Puerto Rico". Circ. No. 63, Est. Expt. Insular, Río Piedras, P. R., pp. 5-11, fig. 4. San Juan, October 1921 (Reprinted under same title in Agr. Puer-torriqueña, Vol. 11, No. 7, pp. 7-8, 28. fig. 3. San Juan, 1921): first record in P. R., life-history and control.

More, J. D., "Instrucciones concernientes al Gusano Rosado del Algodón". Rev. Agr. P. R., Vol. 6, No. 5, pp. 21-26. San Juan, 1921.

Catoni, L. A., "Insectos que atacan al Algodón". Rev. Agr. P. R., Vol. 6, No. 3, pp. 25-31. San Juan, 1921.

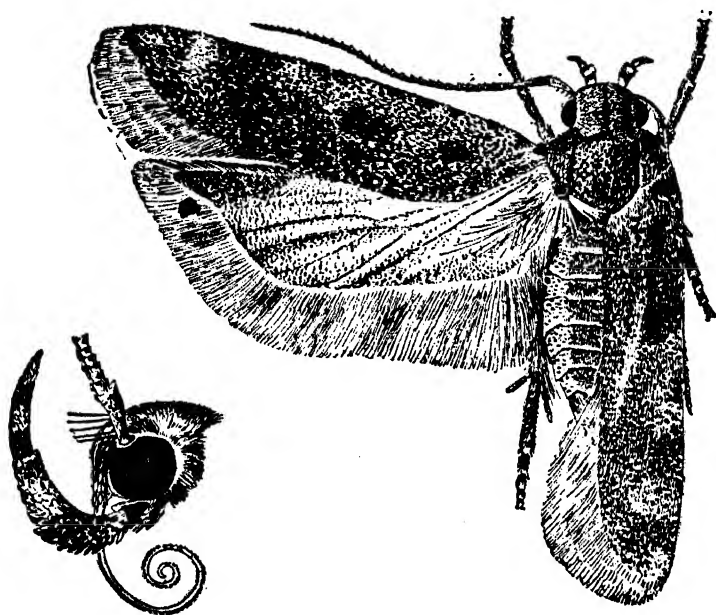
Catoni, L. A., "A los Cosecheros de Algodón en Puerto Rico". Rev. Agr. P. R., Vol. 7, No. 6, pp. 25-26. San Juan, 1921.

Camuñas, M., "A los Agricultores de Puerto Rico y especial-mente a los Cosecheros de Algodón". Rev. Agr. P. R., Vol. 7, No. 3, pp. 5-7. San Juan, 1921.

Legrand, J. F., "El Gusano Rosado del Algodón (*Pectinophora gossypiella*)". Rev. Agr. P. R., Vol. 7, No. 3, pp. 9-13. San Juan, 1921.

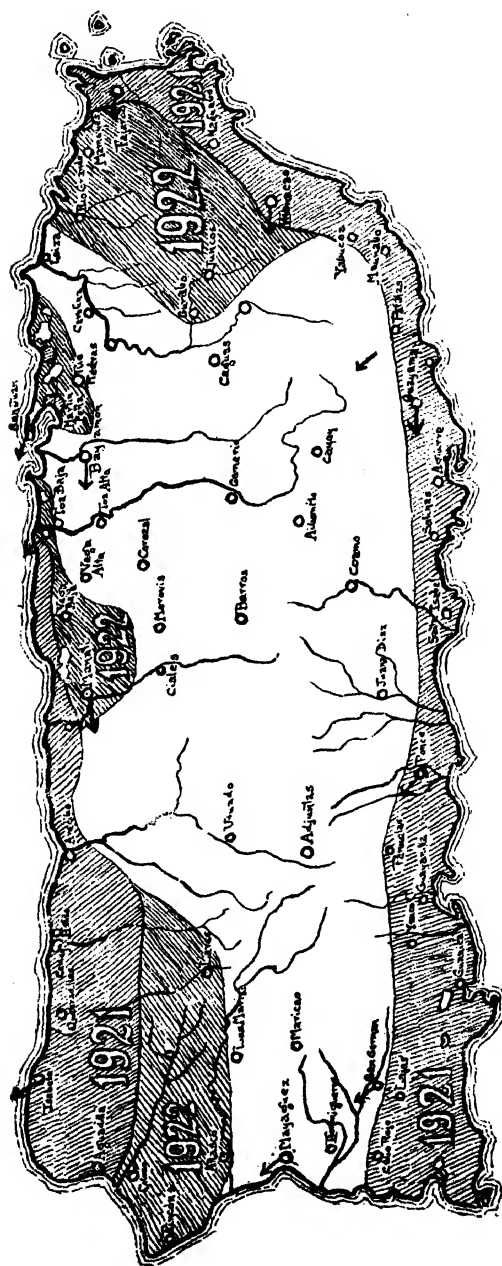
Luciano, J., "Datos sobre la Campaña del Gusano Rosado de la Cápsula del Algodón". Rev. Agr. P. R., Vol. 8, No. 3, pp. 63-64. San Juan, 1921.

- Catoni, L. A., "Informe de las Actividades de la Campaña de Eradicación del Gusano Roado en Puerto Rico, llevada a cabo por el Departamento de Agricultura y Trabajo". Rev. Agr. P. R., Vol. 8, No. 4, pp. 15-22. San Juan, 1922.
- Wolcott, G. N., "The Distribution of the Pink Bollworm of Cotton, *Pectinophora gossypiella* Saunders, in Porto Rico". Jour. Ec. Ent., Vol. 15, No. 4, pp. 313-314, Map. Geneva, N. Y., August 1922: distribution in the spring of 1922.
- Wolcott 22-59: the same data, also in Spain h, Rev. Agr. P. R., Vol. 8, No. 2, pp. 65-68. San Juan, 1922.
- U. S. Dept. Agr., Federal Hort. Board, "Service and Regulatory Announcements July-December 1921". No. 71 pp. 95-178.



Pectinophora gossypiella Saunders. Ten times natural size.
(After Busck.)

- Washington, D. C., 1922: an anonymous report (of the observations of Aug. Busck) on the occurrence of pink bollworm in P. R. and the West Indies; considered due to the importation of Egyptian cotton seed into the Island of St. Croix in 1911-12.
- Legrand, J. F., "Notas de Interés. Entomología." Rev. Agr. P. R., Vol. 10, No. 4, 49-50. San Juan, 1923.
- Wolcott, G. N., "The Distribution of the Pink Bollworm in Porto Rico". Circ. No. 85, Ins. Expt. Station, Río Piedras, pp. 7. Map. San Juan. September 1923.



The dispersion of the pink bollworm in Puerto Rico during 1922, shown by shading from northeast to southwest; distribution at the end of 1921 by shading from northwest to southeast. Direction of prevailing winds shown by arrows flying with the wind. (Drawn by G. N. Wolcott.)

Wolcott 24-56: the same data summarized.

EEP-60 to 62: an economic illustrated account.

Saavedra, E. F., "La Oruga Rosada de la Cápsula del Algodón en Puerto Rico". Rev. Agr. P. R., Vol. 23, No. 5, pp. 207-216. San Juan, 1929.

(as *Platyedra*) Forbes 30-129: "Generally distributed".

Leonard, M. D., "Recomendaciones para combatir las Plagas que afectan en Puerto Rico al Cultivo del Algodón". Notas de la Est. Expt. Insular, Río Piedras, P. R., No. III. (Mimeographed) Río Piedras, September 1930. Also in "El Mundo" San Juan, Oct. 14, 1930, and in Rev. Agr. P. R., Vol. 25, No. 4, pp. 135-136 & 163-164. San Juan, 1930.

Leonard 31-114, 119: notes.

Loftin, U. C., "Preliminary Report on the Pink Bollworm Situation in Porto Rico". 15 pp. (A typewritten report prepared shortly after a visit of several days to P. R. in May 1931) 1931.

Pastor Rodríguez, J., "Alarmanante Irrupción de la Oruga Rosada del Algodón en el Distrito Sur". Rev. Agr. P. R., Vol. 26, No. 9, pp. 174-76. San Juan, 1931.

Riollano 31-109: on Vieques Id.

Torres, I. L., "Campaña contra el Gusano Rosado del Algodón". Rev. Agr. P. R., Vol. 26, No. 9, pp. 175-176. San Juan, 1931.

Wolcott, G. N. & Seín, F., "La Oruga Rosada de la Cápsula del Algodón en Puerto Rico". Circ. No. 95, Est. Expt. Insular, Río Piedras, pp. 13, fig. 3. (A revision of Circ. No. 63.) San Juan, 1931.

Colón 31-99: cotton planting restrictions.

Wolcott, G. N., "The Infestation of Young Okra Pods by Pink Bollworm in Porto Rico". Jour. Dept. Agr. P. R., Vol. 15, No. 4, pp. 395-398. San Juan, 1931.

Wolcott 33-48: abundance of at Isabela prevents production of okra for export.

Leonard, M. D., "The Pink Bollworm of Cotton in Porto Rico". Jour. Dept. Agr. P. R., Vol. 16, No. 1, pp. 65-73, ref. 22, map. San Juan, January 1932.

Leonard 32-129: extensive notes on infestation.

Faxon & Trotter 32-446: in okra pods, maga pods and wild and cultivated cotton.

Leonard 33-112: reduction in infestation due to clean-up and reduction in acreage planted.

Wolcott 33-266: appeared in P. R. in 1921, almost total infestation of crop of 1931-32, rapid recession since due to hurricane of San Ciprián and no commercial plantings.

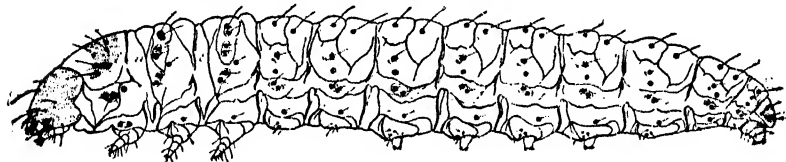
EEWI-300: persisting in maga out of cotton season; an economic account.

Pastor Rodríguez 33-23 to 27: economic notes.

Wolcott 34-95: observations made with U. C. Loftin in April, 1933.

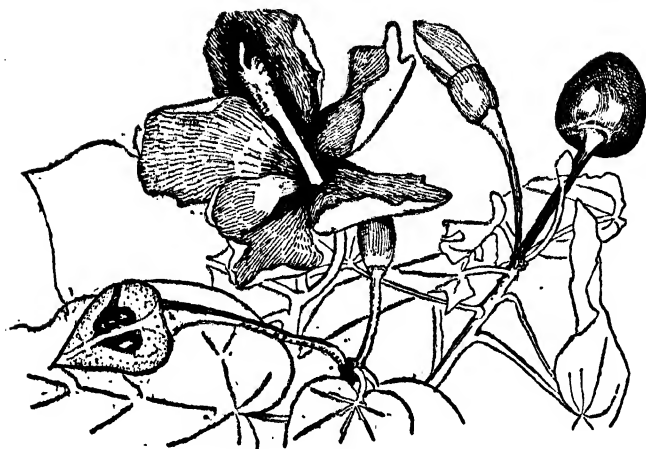
Mellado, Antonio, "Campana para Combatir la Oruga Rosada del Algodón". Tierra y Patria, Vol. 1, No. 1, p. 28. San Juan, April 15, 1935: \$62,000.00 spent by P.R.E.R.A. in seven months in clean-up campaign in destroying wild cotton.

larvae in cotton bolls at Humacao, August 13, 1921, col. Ignacio Torres (509-21, 263-21, 510-21, 427-22, 591-22), at Yabucoa (512-22, 513-22), at Maunabo (514-22, 529-22, 530-22, 24-33), at Patillas (510-22, 536-22), at San Lorenzo (207-23), at Cayey (206-23), at Guayama (511-22, 537-22), at Aguilla, December 21, 1921, col. F. S. Earle (508-21), at Salinas (531-22, 532-22, 534-22), at Fortuna (377-21), at Peñuelas (378-21), at Guayanilla (378-21, I No. 1378), at Guánica Sept. 9, 1921 (275-21, 501-22, 501A-22, 558-22), at Sabana Grande (502-22, 503-22, 561-22, 563-22, 564-22, 565-22, 566-22), at Cabo Rojo (500-22, 506-22), at Boquerón (168-23, 22-23), at Mayagüez (274-23), at Añasco (555-22), at Córscica (567-22, I No. 668), at Coloso (556-22), at Moca (507-22), at Lares (505-23, 304-23), at Bayaney, 15 Km. south of Arecibo (553-22), at 12 Km. south of Arecibo (554-



Larva of *Pectinophora gossypiella* Saunders. Eight times natural size.
(After Busck.)

22), at Arecibo September 3, 1921 (268-21, 270-21, 341-21), at Camuy September 6, 1921 (269-21, 273-21, 504-21), at Hatillo (271-21, 272-21, 501-21, 502-21, 505-21, 506-21, 507-21, 571-22, 572-22, 576-22), at Isabela September 7, 1921 (274-21, 57-33), at Garrochales (573-22), at Barceloneta (577-22), at Vega Baja (514-21, 518-22, 522-22, 525-22, 646-22, 569-22, 574-22), at Manatí (506-23), at Morovis (507-23), at Toa Baja (522-23), at Dorado (540-22, 562-22), at Pt. Salinas (521-23), at Pueblo Viejo (508-23, 518-23), at Río Piedras (517-23), at Pt. Cangrejos (539-22, 500-23), at Loíza (559-22), at Río Grande (588-22, 589-22), at Mameyes (519-22, 535-22), at Luquillo (590-22, 593-22), at Fajardo (513-21, 518-22, 538-22), at Naguabo, September 8, 1921 (276-21, 526-22), at Río Blanco 208-23), at Las Piedras (511-21), at Juncos (592-22), on Mona Id. (57-25); larva in okra at Humacao (512-21), at Trujillo Alto (I No. 1460), at Isabela (GNW); in maga pods at Isabela (54-25 det. C. Heinrich, 167-31 det. A. Busck, 11-43, I No. 587, 588, 669, 670, 672), at Villalba (25-33); in majaguillo, *Thespesia populnea*, at Hatillo, October 1931, 2% infestation just after cotton had been harvested, none in May 1932 (169-31).



Maga infested by Pink Bollworm.
(Drawn by G. N. Wolcott.)

INFESTATION OF MAGA PODS BY PINK BOLLWORM IN P. R.

Place	Date	Number of Pods	Infestation
Isabela.....	September 29, 1931.....	160.....	42.0%
Isabela.....	October 7, 1931.....	50 large.....	90.0%
Isabela.....	November 12, 1931.....	40 large.....	45.0%
Isabela.....	December 10, 1931.....	8 large.....	37.5%
Isabela.....	December 12, 1931.....	100.....	6.0%
Isabela.....	January 5, 1932.....	100.....	6.0%
Isabela.....	February 15, 1932.....	100.....	14.0%
Isabela.....	March 8, 1932.....	200.....	5.0%
Isabela.....	March 17, 1932.....	220.....	7.5%
Isabela.....	April 2, 1932.....	500.....	6.6%
Isabela.....	May 10, 1932.....	150.....	7.5%
Isabela.....	June 18, 1932.....	75 large.....	10.0%
(hurricane of San Ciprian)			
Isabela.....	April 20, 1933.....	500.....	20
Toa Baja.....	May 10, 1933.....	80-40 large.....	20
Isabela.....	June 20, 1933.....	200.....	20
Isabela.....	Aug. 17, 1932.....	110.....	20
Isabela.....	April 25, 1934.....	50 large.....	8.0%
Isabela.....	Nov. 14, 1934.....	250.....	20
Isabela.....	Jan. 17, 1936.....	300.....	20

All records by George N. Wolcott.

XYLORICTIDÆ

Mothonica ocella Forbes 30-131, figs. 3-8: (TYPE from Guatemala), others from Naguabo, P. R.

Stenoma sp.—det. C. Heinrich
in *Inga vera* seeds at Mayagüez (I No. 3511).

Schistonoea fulvidella Walsingham
(as *Paranoea*) Forbes 30-120: on Culebra Id.
Forbes 31-378: generic transfer; at Coamo Springs, San Germán, Isabela, Dorado, Santurce and on Vieques Id.

OECOPHORIDÆ (ETHMIIDÆ)

Ethmia abraxasella Walker
(as *Psecadia aurcoapicella* sp. nov.) Möschler 89-341: TYPE from P. R. Gundlach.
(as *Ethmia aureoapicella* Möschler and *E. abraxella* Walker, not in synonymy) IP-203 & 204: adults at light at Guánica (599-13 det. A. Busck).
Van Z. (P. R. 1403).
Forbes 30-134: at Coamo Springs and Ensenada; synonymy.

Ethmia confusella Walker
(as *Psecadia ingricella* sp. nov.) Möschler 89-343, fig. 19: TYPE from P. R. Gundlach.
IP-204: synonymy.
Van Z. (P. R. 1404).
Forbes 30-134 & 31-379: common; at Coamo Springs, San Germán, Ensenada, and on Vieques and Culebra Ids.
adults at light at Guánica (622-13 det. A. Busck).

Ethmia joviella Walsingham
Forbes 31-379: at Río Piedras and Isabela.

Ethmia kirbyi Möschler (as *Psecadia*) 89-342: TYPE from P. R. Gundlach. IP-204. Forbes 30-133 & 31-379: at Coamo Springs.

Ethmia notatella Walker
(as *Psecadia xanthorrhoea* Zeller) Möschler. Gundlach.
(as *E. xanthorrhoea*) Van Z. (P. R. 1405) IP-203: adults at light at Guánica (604-13 det. A. Busck), and not in synonymy with *Ethmia notatella* Walker, also given on authority of A. Busck.
Forbes 30-133: at Coamo Springs and Ensenada.

Ethmia nivosella Walker
(as *Psecadia adustella* Zeller) Möschler. Gundlach.
(as *Ethmia adustella* Zeller) Van Z. (P. R. 1402). IP-203: adults at light at Guánica (596-13 det. A. Busck).
Forbes 30-134: synonymy.

- Triclonella rhabdophora** Forbes 30-135, fig. 9: (TYPE from St. Thomas), others from Vieques Id.
Forbes 31-379: common on Vieques Id.

COLEOPHORIDÆ

- Coleophora pulchricornis** Walsingham
Forbes 30-138 & 31-379: at Coamo Springs and on Vieques Id.
Coleophora sp.—det. A. Busck
Wolcott 21-37: the "Sugar Cane Case-Bearer", at Toa Baja.

GRACILARIIDÆ

- Spanioptila spinosum** Walsingham
Forbes 31-380: at Coamo Springs.
Acrocercops albomarginata Walsingham
Forbes 30-142 & 31-380: at Coamo Springs.
Acrocercops cymella Forbes 31-380, fig. 23: TYPE from Coamo Springs, P. R.
Acrocercops dives Walsingham
Forbes 30-141: at Mayagüez.
Acrocercops inconspicua Forbes 30-142: TYPE from Yauco, P. R.,
"larva mining in leaves of Pendula (*Citharexylon fruticosum*)."
the above material (502-23 TYPE).
Acrocercops pontifica Forbes 31-380, fig. 24: TYPE from El Yunque, P. R.
Acrocercops rendalli Walsingham ?
Forbes 30-142: reared by Thos. H. Jones from Malvaceae.
larvae miners in leaves of Malvaceous weed (529-12 det. as *Dialectica* sp., A. Busck).
Acrocercops sanctaecrucis Walsingham—det. A. Busck
Cotton 18-300: mining in eggplant leaves. Notes.
Forbes 30-141: short description of adult.
Forbes 31-380: at Coamo Springs and Las Cruces (Cidra).
EEWI-587: serious in eggplant seedbeds.
larvae mining in leaves of eggplant and *Solanum torvum* (108-16, 525-17, 580-17), at Isabela in eggplant seedbed, cocoons January 6th, adults January 13, 1932 (GNW).
Acrocercops zebrulella Forbes 31-381, fig. 21 & 22: TYPE from El Yunque, P. R.
Acrocercops sp. nov. W. T. M. Forbes
reared from serpentine mines in leaves of sea-grape at Mayeyes (8-36).
Gracilaria aeneocapitella Walsingham
Forbes 31-382: at Lares.

Leucoptera coffeella Guerin

Barrett 04-444: van Leenhoff 04-454; Earle 04- : the coffee leafminer. Notes.

Barrett 05-397: parasitized by *Chrysocharis livida* Ashmead.

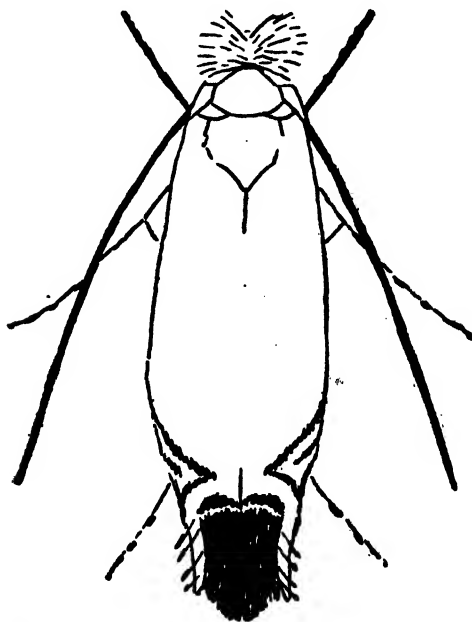
Barrett 06-22: parasitized by *Zagrammosoma multilineata* Ashmead. *Chrysocharis livida* present throughout the coffee-growing sections.

Van Leenhoff 06-46: severe outbreaks cause shedding of leaves.

Hooker 13-44: notes.

Van Zwaluwenburg 15-32: a rather extend account, life-history and unsuccessful control measures.

Van Zwaluwenburg 17-514: Van Z. (602) on coffee.



Leucoptera coffeella Guerin. Twenty-five times natural size. (Drawn by G. N. Wolcott.)

Wolcott, G. N., "El Minador de las Hojas del Café", Circular No. 52, Insular Experiment Station, Río Piedras, P. R., October, 1921, pp. 1-12, figs. 6.

Wolcott, G. N., "A Reaction to a Variation in Light Intensity by *Leucoptera coffeella*". Ecology, Vol. 3, No. 1, January, 1922, p. 86.

IP-205: larvae in coffee leaves at Jájome Alto (30-21), at Lareo (631-21), common throughout the island wherever the host occurs, an especially serious pest south of Adjuntas.

- EEP-50 to 53: an illustrated, economic account.
 Forbes 30-146: "common in all the coffee-growing districts."
 Leonard 31-117 & 32-120: control by spraying with nicotine in seed beds.
 Medina, Vicente, "El Control de Enfermedades y Plagas en los Semilleros y Viveros de Café." Boletín Agrícola, No. 7, pp. 2-3. San Juan, September 26, 1931: recommending spraying with nicotine.
 EEWI-336: parasites not effective in control, lack of shade appears to increase the amount of infestation; wind-swept ridges and the edges of groves appear to be more heavily infested. "Spraying with nicotine sulfate in seed beds had an extensive trial in Porto Rico following the San Felipe hurricane of 1928, and in the same length of time has made possible the production of seedlings three and four times as high as those in unsprayed beds."

OINOPHILIDÆ

Ereunetis aeneoalbida Walsingham

Forbes 31-382: at San Germán and Aguirre.

Ereunetis minuscula Walsingham—det. A. Busck

IP-205: larvae under scale insects, *Diaspis pentagonia*, on papaya (816-12); feeding on scale insects, *Lepidosaphes beekii*, on grapefruit tree (16-17); a scavenger on old cotton bolls at Humacao (551-21 det. C. Heinrich), at Fortuna (556-21), at Mameyes (521-22); in dry okra pod at Vega Baja (559-21), in partitions of pods of *Thespesia populnea* at Guayanilla (557-21).

Forbes 30-147.

Leonard 32-1106: feeding on Cottony Cushion Scale (quoted by Wolcott & Seín 33-213).

on old coconut palm leaves (519-23), in old cotton lint at Vega Baja (510-23); in cowpeas on Vieques Id. (I No. 1296); adults at light at Bayamón (I No. 3381, 3383).

Ereunetis particolor Walsingham—det. A. Busck
 (509-23).

Taeniodictys sericella Forbes, W. T. M., "Two Wasp-Guests from Puerto Rico (Microlepidoptera)." Psyche, Vol. 40, No. 3, pp. 89-92, pl. 1. Cambridge, September, 1933: TYPE from Lares, P. R., reared by F. Seín from nests of *Polistes crinitus*.

Opogona sp.—det. A. Busck

IP-206: larvae scavengers in old leaves of coconut palm previously infested with *Homaledra sabalella* Chambers (596-22).
 Forbes 30-148: "closely related to *O. rhynchaema* Meyrick, of Brasil, but appears to be distinct."

TISCHERIIDÆ

Tischeria heliopsisella Chambers

Forbes 30-150: at Mameyes (Thos. H. Jones).

larvae mining in leaves of *Piper* sp. ? on El Yunque (814-12).

PSYCHIDÆ

Oiketicus kirbyi Guilding

Möschler.

Gundlach, "La Oruga vive sobre *Persea*, *Cupania*, *Terminalia*, etc."Wolcott 24-20, 34: eaten by *Anolis pulchellus* and *A. cristatulus*.

Forbes 30-150 & 31-383: at Aibonito and Dorado (cases only).

EEWI-515: Gundlach's records, larvae in bags eaten by lizards. defoliating small ceiba tree near Laguna de San José (52-35); very abundant on "ciprés", *Thuja orientalis*, around lily-pool at Forest Station, Río Piedras (GNW), at Ponce (GNW).

TINEIDÆ

Setomorpha insectella F.—det. A. Busck

IP-206: larvae in bottle of paprika (589-12).

Forbes 30-152. Forbes 31-384: in wasp nests (F. Seín).

adults at light at Bayamón (I No. 2787, 3011, 3384).

Tiquadra aeneonivella Walker(as *T. aspera* Zeller) Möschler. Gundlach.(and as *T. inscitella* Walker—det. A. Busck, not in synonymy)IP-206: pupa in rotten *Erythrina* tree at Cayey (420-22).

Forbes 30-152: re-identification.

Amydria sp. near or = **umbraticella** Busck

larvae in underground rotten stem of sugar-cane (61-15 det. A. Busck).

Myrmecozela ochraceella Tengström

Möschler. Gundlach. Forbes 30-154: "undoubtedly an accidental introduction from Europe."

Achanodes antipathetica Forbes 31-384: TYPE from Santurce, others from San Juan, Dorado, Coamo Springs, Isabela, San Germán, P. R. and Vieques Id.**Antipolistes anthracella** Forbes 33-92: TYPE from Lares, P. R., reared by F. Seín from nests of *Polistes crinitus*.**Tineola uterella** Walsingham—det. A. Busck

IP-206: larvae living in flattened cases on walls of houses (162-12).

Wolcott 24-31: eaten by *Anolis cristatulus*.

Danforth 26-122: eaten by Northern Water Thrush.

Forbes 30-154: "The larva is a general scavenger, and has once or twice been reported living as a clothes-moth."

(I No. 2105); larvae feeding on remains of dead cockroach (164-32), feeding on clothes in laundry hamper (GNW).

(Tineola biselliella Hummel—the Webbing Clothes Moth

Tinea pellionella L.—the Case-Making Clothes Moth

both species presumably present, and without question one of them, but no specific determination is on record.)

Tinea brevistrigata Walsingham

Forbes 30-157: from Culebra Id. (A. Busck).

Forbes 31-388: at Aguirre.

Tinea familiaris Zeller

Forbes 31-388: at Coamo Springs and on Vieques Id.

Tinea pallidorsella Zeller

Forbes 31-388: on El Yunque.

Tinea scythropiella Walsingham

Forbes 31-388: at Cataño, Palmas Abajo, El Yunque and on Vieques Id.

Homostinea tischeriella Walsingham

(as *Tinea*) Forbes 30-156: from Culebra Id. (A. Busck).

Forbes 31-385: generic transfer, re-description; from El Yunque.

Infurcitinea palpella Forbes 31-386: TYPE from Vieques Id., others from Cataño, P. R.

Infurcitinea luteella Forbes 31-386: TYPE from Vieques Id.

Mea includella Forbes 31-387, fig. 26: TYPE from El Yunque, others from Santurce, P. R.

Mea yunqueella Forbes 31-388, fig. 25: TYPE from El Yunque, P. R., "flying about the face of a cliff near the summit."

Mea sp. nov.—det. A. Busck

larvae making long tunnels of tough silk under bark of *Inga vera* trees dying from attack of *Xyleborus* beetles, at Juana Díaz (48-34).

Protodarcia agryrophaea Forbes 31-390, fig. 28: TYPE from Coamo Springs, P. R.

Protodarcia bicolorella Forbes 31-389, fig. 27: TYPE from Coamo Springs, others from Río Piedras, San Germán and Vieques Id.

Protodarcia plumella Walsingham

Forbes 31-390: at San Germán.

Pexicnemidia mirella Möschler 89-338: TYPE from P. R.

Gundlach. Forbes 30-159.

Pseudanaphora sp. nov. Forbes 31-391: from Aguirre.

Acrolophus (Pseudanaphora) arcanellus Clemens

Forbes 31-390: at Río Piedras.

at light at Utuado (W. A. Hoffman) det. A. Busck.

Acrolophus (Caenogenes) ochraceus Möschler 89-337: TYPE from P. R.

Gundlach. Forbes 30-162: at Coamo Springs.

Forbes 31-393: at Santurce, Cataño and Río Piedras.

Acrolophus (Anaphora) popeanellus Clemens

Möschler. Gundlach. Forbes 30-162: "should be verified."

Acrolophus (Anaphora) mimasalis Walker ?

Forbes 30-163: at Mayagüez and San Juan.

Forbes 31-392: The San Juan specimen is *A. harparsen* sp. nov. Forbes.

Acrolophus (Anaphora) triformellus Forbes 30-163, fig. 8: TYPE from Coamo Springs, others from Manatí, Mayagüez and Santa Rita, P. R., "appears to be the commonest species of *Acrolophus* in P. R."

Forbes 31-391: at San Germán, more reddish, "may turn out to be *walsinghami* Möschler."

(as *Anaphora* sp.—det. E. G. Smyth) IP-207: rare at light (973-16), at Guánica (619-13); larvae dirty brown, spin silken tunnels among trash on ground at Guánica (368-14, 370-14, 520-14, 521-14).

at light at Bayamón (I No. 2737, 3742, 3776).

Acrolophus triatomellus Walsingham

Forbes 31-391: from Vieques Id.

Acrolophus (Acrolophus) harparsen Forbes 31-391: TYPE from Lares, others from San Juan (reported as *mimasalis* Walker ?), Río Piedras, P. R., "also a series in collection of the Insular Experiment Station, presumably from Río Piedras, fresh but faded."

Acrolophus (Acrolophus) vitellus Poey

IP-206: A. Busck. Forbes 30-164.

Acrolophus (Acrolophus) plumifrontellus Clemens

Möschler. Gundlach. Forbes 30-165: "should be verified."

Acrolophus (Acrolophus) walsinghami Möschler 89-336: TYPE from P. R. Gundlach. Forbes 30-165.

(under *Acrolophus (Anaphora) triformellus* sp. nov.) Forbes 30-163 & 31-391: possibility of being Möschler's species.

Acrolophus sp. (possibly *walsinghami* Möschler)

Wolcott 24-100: injury to pastures at Juncos in September 1923.

EEP-44 & EEWI-261: injury to pastures.

Wolcott 24-17, 31: eaten by *Anolis pulchellus* and *A. cristatus*.

caterpillars so numerous as to absolutely destroy pasture grasses at Juncos and Gurabo (229-23).

MEGALOPYGIDÆ

Megalopyge *krugii* Dewitz (as *Lagoa*) 77-95: TYPE from P. R.

(as *Megalopyge*) Möschler 89-122. Gundlach 91-465 (No. 148).

Van Z. (1662) on *Inga vera*, *Terminalia catappa* and coffee.

Van Zwaluwenburg 15-31: on guamá, *Inga laurina*, and coffee.

Van Zwaluwenburg 15-34: "The larva is covered with long white hairs and is provided with brittle spines which cause a burning sensation if allowed to come in contact with the skin. The pupa-case, with a 'trap-door' exit at one end, 16 × 10 mm., is formed of the hairs of the larva mixed with a substance secreted by the mature larva."

Forbes 30-166: notes and locality records.

Forbes 31-393: additional locality records.

at light (I No. 2846), at Guánica (565-13); resting on al-mendra at Manatí (I No. 1034 Leonard 33-129); larvae on grapefruit (106-16), at Mayagüez (I No. 511), at Trujillo Alto (I No. 802, 803); on guava, *Psidium guajava* (38-21 parasitized by *Chalcis robustella* Wole.); on mangrove and *Conocarpus erecta* at Martín Peña (142-23); on cacao at Ciales (470-21); cocoons very abundant on the trunks of *Erythrina glauca* trees at Cayey, and common on coffee, *Inga vera* and *Inga laurina* throughout the coffee districts. (GNW) Larva known as "chiva" or "plumilla". The old cocoons furnish shelter for small spiders and many small insects, especially cockroaches and ants.

EUCLEIDÆ (LIMACODIDÆ)

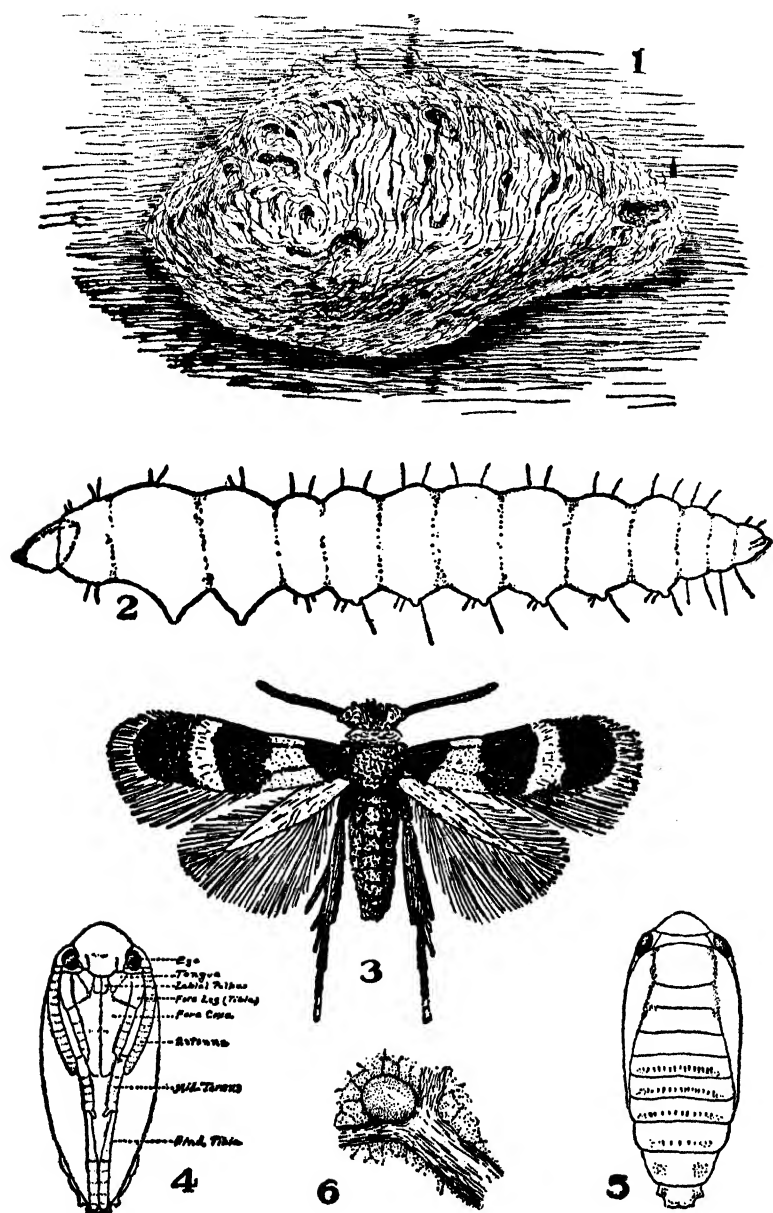
Monoleuca albicollis Forbes 30-167: TYPE from Coamo Springs, P. R.

NEPTICULIDÆ

Nepticula gossypii Forbes, W. T. M. & Leonard, M. D., "A New Leaf-Miner of Cotton in Porto Rico." Jour. Dept. Agr. P. R., Vol. 14, No. 3, pp. 151-157, pl. 2. San Juan, August 1930: TYPE from Juana Díaz, P. R.

Forbes 30-168 & 31-393: on the South Coast, from Guayanilla to Yauco, exceedingly rare, if present at all, on the North Coast and on Vieques Id.

Rainwater, C. F., "Insects and a Mite of Potential Economic Importance found on Wild Cotton in Florida." Jour. Ec.



Nepticula gossypii Forbes & Leonard: 1, cocoon, 2, larva, 3, adult, 4 & 5, pupae, 6, egg. (After Forbes & Leonard.)

Ent., Vol. 27, No. 4, pp. 756-761, ref. 4. Geneva, N. Y., August 1934: at Angelfish Key, Key Largo, Cape Sable and around Fort Myers, Florida, causing severe shedding of the foliage.

presumably this species in leaves of hollyhocks in greenhouse at Río Piedras (GNW).

Nepticula sp. Forbes 31-393: at Coamo Springs.

HYMENOPTERA

- (Cresson, E. T., "On the Hymenoptera of Cuba." Proc. Ent. Soc. Philadelphia, January, 1865. pp. 1-200. Contains descriptions of many species found in Porto Rico.)
- Dewitz, H., "Hymenopteren von Portorico." Berliner Entomologische Zeitschrift, Vol. 25, pt. 2, pp. 197-208, 1881.
- Ashmead, W. H., "Report on the Aculeate Hymenoptera of the Islands St. Vincent and Granada, with additions to the Parasitic Hymenoptera, and a List of the Described Species of the West Indies." Trans. Ent. Soc. London pt. 2, July, 1900.
- Crawford, J. C., "Descriptions of New Hymenoptera." Proc. U. S. National Museum, No. 6, Vol. 45, pp. 241-260, May 22, 1913.
- Viereck, H. L., "Descriptions of Ten New Genera and Twenty-five New Species of Ichneumon Flies." Proc. U. S. National Museum, Vol. 44, No. 1968, pp. 555-568, April 18, 1913.
- Rohwer, S. A., "Descriptions of New Species of Hymenoptera." Proc. U. S. National Museum, Vol. 49, No. 2105, pp. 205-249, July 16, 1915.
- Dozier, H. L., "Some New Porto Rican Scale Parasites (Hymenoptera)." Proc. Ent. Soc. Washington, Vol. 35, No. 6, pp. 85-100, fig. 1. Washington, D. C., May 1926.
- Dozier, H. L., "Miscellaneous Notes and Descriptions of Chalcoid Parasites (Hymenoptera)." Proc. Ent. Soc. Washington, Vol. 35, No. 6, pp. 85-100, fig. 1. Washington, D. C., June 1933.

To Mr. S. A. Rohwer the compiler is most greatly indebted for the determination of many specimens, and for suggesting many changes and corrections in the first draft of this section of the list. In the groups in which they make determinations, many specimens have been determined by Messrs. A. B. Gahan, R. A. Cushman (both

of whom suggested some changes in the original manuscript), J. C. Crawford, C. F. W. Muesebeck, A. A. Girault and Miss Grace A. Sandhouse, and a few by Mrs. C. J. Weld. In the preparation of this revision, the compiler is further indebted to Mr. Gahan for additional records and corrections in spelling and synonymy.

Dr. Wm. M. Wheeler determined most of the ants, altho Dr. Wm. Mann and Dr. M. R. Smith made some of the more recent determinations. Mr. J. D. More prepared the first draft of the section on Formicoidea.

TENTHREDINOIDEA

TENTHREDINIDÆ

Sterictiphora zaddachi Dewitz (as **Schizocera**) 81-207: TYPE from P. R.=

Schizocera krugii Cresson, E. T., Trans. Amer. Ent. Soc., Vol. 8, p. 54. 1880: TYPE from P. R.

Gundlach. Ashmead: giving both names.

Van Zwaluwenburg 18-28: an extended account, larvae feeding on sea-grape, *Coccoloba uvifera*, and icaco, *Chrysobalanus icaco*.

Wolcott 26-51: on sea-grape.

larvae on sea-grape on the beach at Santurce (35-13) at Arecibo (GNW), at Añasco (I No. 2299), at Ponce (55-35), at Salinas (I No. 2655), at Maunabo (U. C. Loftin), at Mayeyes (GNW)—often in such abundance to entirely strip the host of its leaves over considerable areas.

ICHNEUMONOIDEA

ALYSIDÆ

Alysia analis Cresson—det. A. B. Gahan

at Ponce (I No. 2577), at Villalba (I No. 5174), at Vega Alta (I No. 5190), at Pueblo Viejo (I No. 5310); on guava at Bayamón (I No. 3365); in cane fields (80-13, 90-13), at Arecibo (15-15), at Guánica (41-22); in coffee groves at Cayey (371-21), at Ciales (78-82), in mountains north of Yauco (202-23); being caught and killed by *Zelus longipes* L. in mountains north of Yauco (44-23).

Alysia ridibunda Say—det. R. A. Cushman
(I No. 877).

BRACONIDÆ

Opius (Utetes) anastrephae Viereck 13-564: TYPE from Mayagüez, P. R.

Hooker 13-36: attacking larvae of *Anastrepha fraterculus* Wied. in fruit of jobo, *Spondias lutea*. Van Z. (5063).

EEWI-506, "not abundant and a very minor factor in control."
 reared at Cidra (I No. 1507), at Villalba (I No. 1632), at
 Maricao (I No. 1566-B), at Limón (I No. 5783), at Las Vegas
 (I No. 5785), at Arecibo (I No. 1517, 1563-B, 1568-B), at Ma-
 yagüez (I No. 1195) Leonard 32-143, 1525-B, 1586, 4739);
 from fruit fly larvae in pomarrosa at San Sebastián (I No.
 1450).

Opius insularis Ashmead—det. A. B. Gahan
 from *Agromyza* sp. on *Hyptis pectinata* (1123-16).

Opius sp. nov.—det. C. F. W. Muesebeck
 resting on pomarrosa at Bayamón (I No. 5328 as "sp.");
 reared from pupae of *Agromyza jucunda* in wild morning
 glory at Vega Alta (I No. 3298-B).

Apanteles aletiae Riley—det. A. B. Gahan
 Wolcott 24-56: as below.
 from small larva of *Alabama argillacea* Hübner at Hatillo
 (330-22).

Apanteles americanus Lepeltier—det. C. F. W. Muesebeck
 reared from *Erinnyis ello* on yuca at Barceloneta (I No.
 3358, 175-32); from same host on papaya at Mayagüez (I
 No. 5772), at Bayamón (I No. 5921).

Apanteles carpatus Say—det. C. F. W. Muesebeck
 (the clothes-moth parasite) in San Cristóbal Apts., San
 Juan (I No. 5380); on French boat in San Juan harbor (I
 No. 3074).

Apanteles congregatus Say—det. A. B. Gahan
 from larva of *Protambulix strigilis* L. (22-19).

Apanteles flaviventris Cresson
 (as *Protapanteles*) Van Z. (5023) from *Dilophonota ello* L.
 (as sp.) Wolcott 24-17, 20, 23, 29: eaten by *Anobis pulchellus*,
A. krugii and *A. cristatellus*.
 from sphinx caterpillar, *Erinnyis ello* L., (396-12), at
 Guánica (200-15, 222-15, 372-15).

Apanteles laevigatus Ashmead—Gahan, A. B., "Miscellaneous De-
 scriptions and Notes on Parasitic Hymenoptera." Ann. Ent.
 Soc. America, Vol. 25, No. 4, p. 737. Columbus, 1932.

Apanteles leucostigmus Ashmead—det. A. B. Gahan
 EEP-108: as below.
 from larva of *Eudamus proteus* L. (27-13), at Guánica
 (634-14); swept from weeds at Dorado (I No. 3593).

Apanteles marginiventris Cresson — **Apanteles grenadensis** Ash-
 mead—det. A. B. Gahan.
 Jones & Wolcott 22-44 & 47: from *Cirphis latiuscula* H. S. and
Laphygma frugiperda S. & A.
 from *Laphygma frugiperda* S. & A. at Garrochales (GNW).

- Apanteles mayaguezensis** Viereck 13-563: TYPE from Mayaguez, P. R.
 Van Z. (5095).
 from sphinx caterpillar on *Cissus sicyoides* (123-21 — det. A. B. Gahan).
- Apanteles militaris** Walsh—det. C. F. W. Muesebeck
 from *Plusia rogationis* (62-16), from *Cirphis latiuscula* (630-12).
- Apanteles** near **nigriceps** Ashmead—det. C. F. W. Muesebeck
 at Pueblo Viejo (I No. 5278).
- Apanteles prenidis** Muesebeck, C. F. W., "A Revision of the N. A. Species of Ichneumon-Flies belonging to the Genus *Apanteles*." Proc. U. S. National Museum, Vol. 58, No. 2349, pp. 483-576, 1920; TYPE from Luquillo, Porto Rico, (p. 558), reared from *Prenes ares* Felder.
 Wolcott 21-39: from *Prenes nero* Fabr.
 Jones & Wolcott 22-41 & 42: from *Prenes nero* F. & *P. ares* Felder.
 from larva of *Prenes ares* Felder at Luquillo (186-13 TYPE); from *Prenes nero* Fabr. (GNW—det. Muesebeck).
- Apanteles** sp. nov.—det. C. F. W. Muesebeck
 from cocoon of *Psara bipunctalis* in pepper at Humacao (I No. 1867-B); swept from weeds (I No. 5468); from *Pluchea* at Pt. Cangrejos (I No. 5521, 5522, 5525, another sp. 5523).
- Crassimicrodus fenestratus** Viereck 13-559: TYPE from Porto Rico.
 at Guánica (453-14 det. A. B. Gahan).
- Microbracon hebetor** Say—det. C. F. W. Muesebeck
 on pigeon peas at Ponce (I No. 2531 Leonard 33-131).
- Microbracon thurberiphagae** Muesebeck—det. C. F. W. Muesebeck
 from larva of *Maruca testulalis* Geyer at Cidra (I No. 1976), at Vega Baja (I No. 2082-B).
- Microbracon** sp.
 Jones & Wolcott 22-42: as below.
 from larva of *Prenes ares* Felder on sugar-cane (1205-13), at Luquillo (188-13).
 Wolcott 24-20: - eaten by *Anolis pulchellus*.
 resting on dahlia at Cidra (I No. 2615 as sp. nov.); at Mayaguez (I No. 4548).
- Chelonus insularis** Cresson
 Dewitz. Gundlach. Van Z. (P. R. 61).
 Jones & Wolcott 22-47: "The female ---, after removing a portion of the hairs from the egg cluster (of *Laphygma frugiperda* S. & A.) lays its eggs in the eggs of the moth. Caterpillars from these eggs issue normally, but they contain the

maggots of the wasp which kill them before they are more than half-grown. The small caterpillars enter the ground as if to pupate, but soon die, and the cocoons of the parasite will be found within the shriveled remains of the host caterpillar."

Wolcott 24-29: eaten by *Anolis cristatellus*.

adults swept from weeds (27-17), on corn at Aguadilla at Guánica (91-13); reared from larvae of *Heliothis obsoleta* Fabr. at Caguas (139-11).

Chelonus meridionalis Ashmead—det. C. F. W. Muesebeck
from ? on *Pluchea* at Pt. Cangrejos (I No. 5524).

Chelonus texanus Cresson—det. C. F. W. Muesebeck
on weeds at Loíza (I No. 4210).

Chelonus sp.—det. C. F. W. Muesebeck
(I No. 5551).

Ascogaster sp.—det. C. F. W. Muesebeck
at Caguas (I No. 5217).

Monogonogaster ventralis Cresson
(as *Bracon*) Gundlach. Dewitz.
Van Z. (P. R. 50).
resting on orange at Trujillo Alto (I No. 694).

Yelicones sp.—det. S. A. Rohwer
from *Tetralopha scabridella* Ragonot on *Inga vera* at Cayey
(12-23).

Phanerotoma sp. nov.—det. C. F. W. Muesebeck
on leaves of *Adenanthera* at Bayamón (I No. 5033, 5123).

Ipbiaulax voraginis Cresson
(as *Bracon*) Gundlach, "en Quebradillas". Dewitz.

Neoclinocentrus sp.—det. C. F. W. Muesebeck
on leaves of *Adenanthera* at Bayamón (I No. 5123).

Bracon guanicana Wolcott IP-67: TYPE from Guánica, P. R.
at Guánica (457-14); in swamp vegetation at Boquerón
(185-23).

Heterospilus etiellae Rohwer—det. C. F. W. Muesebeck
Leonard & Mills 31-470: and Wolcott 33-253: from *Etiella zinckenella* Treit. in lima beans.
reared at Isabela (124-32); from this host on *Crotalaria*
(I No. 1182).

Heterospilus sp. nov.—det. C. F. W. Muesebeck
from guava at Bayamón (I No. 1758), at Arecibo (I No. 1871); on grapefruit at Naguabo (I No. 5251 as "sp."), at Arecibo (I No. 5440), at Trujillo Alto (I No. 5446).

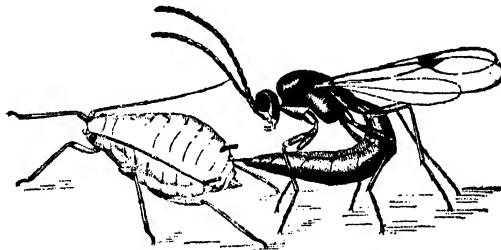
Hoploteleia sp.—det. C. F. W. Muesebeck
on almendra at Bayamón (I No. 5354).

Rhyssalus brunneiventris Ashmead—det. C. F. W. Muesebeck
Wolcott & Seín 33-214: as below.
reared from *Icerya montserratensis* R. & H., at Pueblo Viejo
(134-32), at Isabela (8-34), at Barceloneta (I No. 4720-B).

Bassus (Microdus) sacchari Myers—det. C. F. W. Muesebeck
reared from larvae of *Diatraea saccharalis* F. on sugar-cane,
October 1935, at Hormigueros (K. A. Bartlett).

Meteorus sp.—det. C. F. W. Muesebeck
on pomarrosa at Arceibo (I No. 4972); on *Adenanthera* at
Bayamón (I No. 5033).

Rogas nigristemmaticum Enderlein ?—det. C. F. W. Muesebeck
(as "sp. nov." det. A. B. Gahan) Jones & Wolcott 22-49: from
Renigia repanda F. larvae on sugar-cane.
the above material, at Guánica (429-13); at Bayamón (I
No. 5262).



Aphidius testaceipes Cresson ovipositing in an aphid.
(After Webster.)

Aphidius (Lysiphlebus) testaceipes Cresson

Jones 14-462 & 15 b-17: a parasite of *Aphis setariae* Thos.
Colon 19-30: the same data.

Wolcott 22-5: illustration of parasitism of *Toxoptera aurantiae*
on grapefruit shoot.

EEP-38: a parasite of *Sipha flava* on sugar-cane.

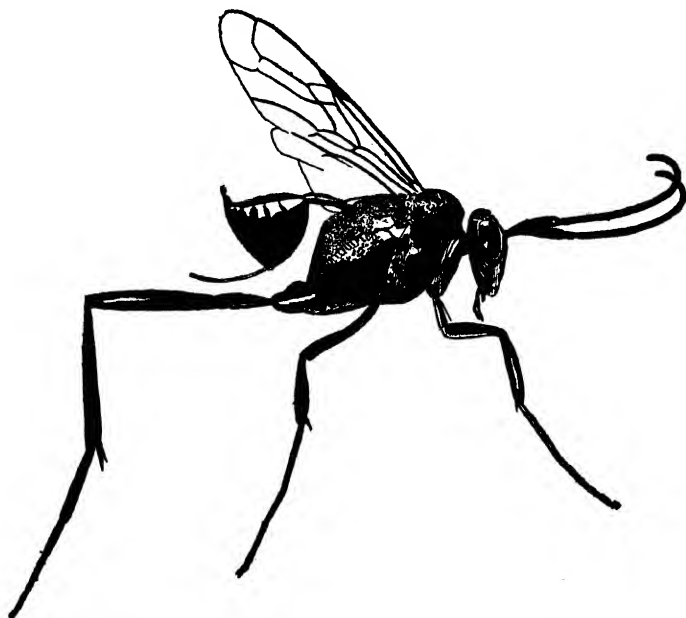
parasitic on aphids: *Hysteroneura setariae* Thomas on sugar-
cane (93-13 det. A. B. Gahan); *Aphis gossypii* Glover on
cucumber (42-12 det. H. L. Viereck), at Caguas (I No. 1779);
Toxoptera aurantiae Koch on grapefruit (GNW), on citrus
and mamey at Isabela Grove (24-16 det. C.F.W. Muesebeck);
on *Myzus persicae* Sulzer on eggplant at Loíza (I No. 2022
Leonard 33-115); on aphids on okra (565-12), on orange (310-
12), on sorghum (528-12); on corn at Palo Seco (I No. 5898).

EVANIIDÆ

Evania appendigaster Linn.

(as *E. laevigata* Oliv.) Dewitz. Gundlach, "Se encuentra muchas veces en las casas, donde la larva se cría en la oötecas de las cucarachas."

Seín 23-5: notes and illustration of adult.



Evania appendigaster L. Five times natural size.
(Drawn by G. N. Woleott.)

EEP-132: quoting Seín.

AMC: at many localities.

from eggs of cockroaches (168-15), at Arecibo (445-13), at Guánica (445-14); (I No. 976, 1508, 1981).

Evania ruficaput Dewitz 81-205, TYPE from Mayagüez, Porto Rico. Gundlach.

Hyptia petifolia Fabr.

Dewitz. Gundlach. Asmead.

Hyptia rufispectus Dewitz 81-205, TYPE from Mayagüez, Porto Rico. Gundlach.

Brachygaster pygmaeus F.—det. R. A. Cushman

on sugar-cane (324-12), at Ponce (I No. 3087); on papaya at Arecibo (I No. 4676); at Ciales (I No. 4898).

ICHNEUMONIDÆ

All determinations of recently collected specimens in this family, and generic transfers in the records of old collections, have been made by Mr. R. A. Cushman.

Charops uncinata Ashmead
(I No. 876).

Messatoporus sp.
at Trujillo Alto (I No. 5446), on mango (I No. 5729).

Stenomacrus sp.
resting on *Adenanthera pavonina* at Bayamón (I No. 5123),
on grapefruit at Naguabo (I No. 5251).

Tetragonchora meridionalis Cresson
(as *Ichneumon*) Stahl.
swept from grass (11-24, 414-17).

Tetragonchora sp. nov.
(I No. 2704).

Amblyteles sp.
on weeds at Bayamón (I No. 5719).

Hemiteles subflavescens Cresson
Stahl.

Hemiteles sp.
at Ciales (I No. 4889); on mango flower at Bayamón (I
No. 5417).

Christolimorpha incertus Cresson
(as *Hemiteles*) Gundlach. Aldrich.
a male from Morovis (GNW—det. GNW).

Christolimorpha plesius Viereck 13-564: TYPE from P. R.
(I No. 875), at Mayagüez (I No. 2546 Leonard 33-136, 3959).

Christolimorpha sp.
(I No. 5587), at female from Ciales (GNW—det. GNW).

Allocota sp.
on almendra at Bayamón (I No. 5354).

Acrocornicus cubensis Cresson
reared from the nest of *Eumenes ornatus* Saussure (290-23).

Lissonota sp.
reared from *Agathodes designalis* Guenee (409-22).

Pimpla rufoniger Cresson
IPSup-36: at Aibonito (SSC).

Theronia bicincta Cresson
(as *Pimpla*) Stahl.

Theronia nubecularia Dewitz (as **Pimpla**) 81-206: TYPE from Mayagüez, P. R.,
(as *Pimpla*) Gundlach.

Labena sp. nov.
at light at Mayagüez (I No. 5775).

Ephialtes marginella Brulle
(as *Pimpla*) Stahl. Gundlach. Ashmead.

Calliephialtes sp. nov.
in grapefruit grove at Añasco (I No. 2293 Leonard 33-131).

Tromatobia cressoni Dewitz (as **Ephialtes**) 81-205: TYPE from Mayagüez, P. R.
(as *Ephialtes*) Gundlach.
fourteen males and two females reared from a cluster of spider eggs at Lares (324-21 det. R. A. Cushman); one female in coffee grove (49-21).

Tromatobia lateralis Cresson
(I No. 874), resting on mango at Guayama (I No. 5308), on grapefruit at Arecibo (I No. 5191).

Tryphon cerberus Dewitz 81-206: TYPE from P. R.
Gundlach.

Enicospilus arcuatus Felt
from Aibonito (SSC).

Enicospilus concolor Cresson
Van Z. (P. R. 1028).
abundant in grass (415-17, I No. 2610); at light at Bayamón (I No. 3753, 5546); on lime at Dorado (I No. 4182).

Enicospilus flavus Fabr.
(as *Ophion*) Stahl. Gundlach, "común."
Van Z. (P. R. 1027).

Enicospilus flaviceps Brulle
at light at Bayamón (I No. 3753).

Enicospilus purgatus Say
Van Z. (P. R. 1029).

Enicospilus thoracicus Cresson
(as *Ophion*) Gundlach.
Van Z. (5083) from *Phlegethontius sexta* Johan.
Wolcott 22c-8: same data.

Eremotylus angulatus Hooker, C. W., "The Ichneumon Flies of America belonging to the Tribe Aphioninae." Trans. Amer. Ent. Soc., Vol. 38, Nos. 1-2, pl. 2, fig. 13, p. 144. Columbus, Ohio, June 12, 1912: TYPE from Mayagüez, P. R.
Van Z. (5037) from larva of *Ecpantheria eridanus* Cramer.
Van Zwaluwenburg, R. H., Ins. Insc. Menstruus, Vol. 4, p. 17. Washington, D. C., 1916: he same record.

Eremotylus glabratus Say

on maga (I No. 2882-B).

Ophion ancyloneura Cameron

(I No. 2619); at light at Bayamón (I No. 4204); resting
corn at Carolina (I No. 3487).

Ophion bilineatus Say

Hooker 12-45:

from Guánica (GBM).

Ophion biangularis Taschenberg

Van Z. (P. R. 1026).

(**Ophion bicarinatus** Cresson MS TYPE from Mayagüez, Porto Rico.
Gundlach.)

(**Ophion obsoletus** Cresson MS TYPE from Porto Rico.
Gundlach.)

Ophiopterus ferrugineus Cresson

Hooker 12-176, b & c:

Idechthis canescens Grav.

resting on banana in boat in San Juan harbor (I No. 3180).

Eiphosoma annulata Cresson

Dewitz. Stahl. Gundlach, "en Utuado". Ashmead.

swept from weeds (139-17), from carrots (692-17 det.
Cushman); from cane at Guánica (102-13, 430-14); "reared
from leaf-roller larva." E. G. Smyth.

Eiphosoma (Brachixiphosoma) insularis Viereck 13-564: TYPE
from P. R.

Eiphosoma nigrovittata Cresson

Dewitz. Gundlach. Ashmead.

swept from carrots (692-17), and unlabeled specimen.

Eiphosoma vitticollis Cresson

from Guánica (444-14 det. GNW).

Labrorychus sp.

on Crotalaria at Vega Baja (I No. 3831).

Cremastus sp. nov.

swept from weeds at Dorado (I No. 3593).

Cremastus sp. (or spp.)

on milkweed flowers at Bayamón (I No. 5541); on kumquat
at Arecibo (I No. 4940); on Crotalaria at Bayamón (I No.
4406); on weeds at Pueblo Viejo (I No. 5236).

Stiboscopus thoracicus Ashmead

in coffee leaf-miner material from Lares (11-35); on El Yunque (I No. 5401), at Adjuntas (I No. 4007, 4008), at Villalba (I No. 5174); at light at Bayamón (I No. 3757).

CYNIPOIDEA

FIGITIDÆ

Ganaspis hookeri Crawford 13-244: TYPE from Porto Rico.

(as sp.) Hooker 13-36: attacking the larvae of *Anastrepha fraterculus* Wied. in fruit of *Spondias lutea*.

EEWI-506: "not abundant and a very minor factor in control." from fruit fly rearing jar (I No. 817), of oranges at Ponce (I No. 1658 det. as "sp"), of *Eupharia didyma* at Mayagüez (I No. 2713).

Eucoila (Hexamerocera) atriceps Ashmead & E. (H.) sp.—det. L. H. Weld.

from fruit fly larvae in pomarrosa fruits at Las Vegas (Mayagüez) (I No. 1456, 2680); at Loíza (I No. 5214), at Mayagüez (I No. 1196, Leonard 32-142).

Xyalosema (Aspicera) bifoveolata Cresson—det. J. C. Crawford
Wolcott 22d-18: from horn-fly pupae at Guánica (G. B. Merrill).

CHALCIDOIDEA

AGAONIDÆ

Idarnes sp. "prob. new"—det. P. H. Timberlake

Wolcott 24-25: eaten by *Anolis stratulus* on *Ficus laevigata* tree. abundant on *Ficus laevigata* at Arecibo (83-23).

Secundeisenia sp.—det. C. F. W. Muesebeck

four wingless males on *Piper* at Cidra (I No. 1631).

MYMARIDÆ

Dozier, H. L., "Descriptions of New Mymarid Egg Parasites from Haiti and Puerto Rico". Jour. Dept. Agr. P. R., Vol. 16, No. 2, pp. 81-91, San Juan, April 1932.**Anagrus armatus** Ashmead—det. A. A. Girault

Jones 14-463: from eggs of *Delphax saccharivora* Westw.

Dozier 32-86: material reared from this host in Haiti, at first determined as above, more closely agrees with the description of *A. flaveolus* Waterhouse but may prove distinct.

EEWI-227: note.

from eggs of *Saccharosydne saccharivora* Westw. on sugarcane (208-11); from eggs of *Liburnia* sp., (probably *Kolla similis* Walker), on *Paspalum* sp. (126-12).

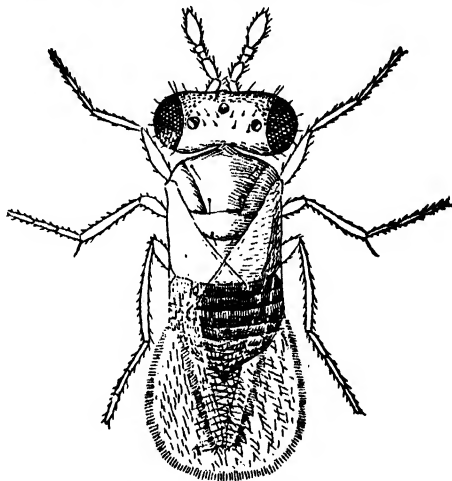
- Polynema** sp. nov.—det. A. B. Gahan
from ? on *Pluchea* at Pt. Cangrejos (I No. 5551).
- Alaptus borinquensis** Dozier 32-90: TYPE from P. R., reared from *Asterolecanium pustulans* material on *Cassia fistula*, May 1925.
- Alaptus caecillii** Girault—det. C. F. W. Muesebeck
reared from Psocid egg-cluster on sugar-cane (702-12).

TRICHOGRAMMIDÆ

- Brachistella prima** Perkins—det. A. A. Girault
from eggs of *Kolla similis* Walker on sugar cane (335-12).
- Ufens osborni** Dozier, H. L., "Descriptions of New Trichogrammatid (Hymenoptera) Egg Parasites from the West Indies." Proc. Ent. Soc. Washington, Vol. 34, No. 3, pp. 29-37. Washington, D. C., March 1932: TYPE from P. R., "reared by Herbert T. Osborn at Central Aguirre, P. R., in 1930 from eggs of the Sugar Cane Root Weevil, *Diaprepes abbreviatus*." Wolcott 33-46 & 34-92; EEWI-141 & 459: apparently a secondary parasite, attacking eggs previously parasitized by *Tetrastichus haitiensis* Gahan.
- Ufens niger** Ashmead—det. A. A. Girault
from eggs of *Kolla similis* Walker on sugar cane (335-12).
- Oligosita comosipennis** Girault—det. A. A. Girault
from eggs of *Kolla similis* Walker on sugar cane (335-12).
- Aphelinoidea semifuscipennis** var. *albipes* Girault—det. A. A. Girault
from eggs of *Liburnia* sp. on *Paspalum* sp. (126-12).
- Poropoea attelaborum** Girault—det. A. B. Gahan
Wolcott 22 a-7: mention.
from eggs of *Attelabus sexmaculatus* Chevrolat (GNW).
- Trichogramma minutum** Riley—det. A. A. Girault
Van Dine 13-29; Van Dine 13-254; Colón 19-144: Smyth 19-144: from eggs of *Diatraea saccharalis* Fabr.
Wolcott 15-2: less abundant in cane fields where trash has been burned as indicated by higher infestation of cane by *Diatraea saccharalis* Fabr.
Jones 15c-14: notes and illustration of parasitized eggs.
Wolcott 22c-24: notes, short description and illustration of adult.
Jones & Wolcott 22-41: from eggs of *Prenes nero* Fabr.
Jones & Wolcott 22-42: from eggs of *Prenes ares* Felder.
Van Z. (5088) from eggs of *Diatraea saccharalis* Fabr.
EEP-22 to 24 & EEWI-68, 174 to 176: extended economic, illustrated accounts as a parasite of *Diatraea saccharalis* F.
Wolcott, G. N., "The Extent to which the Practise of Not Burning Cane Trash has been Adopted in Puerto Rico." Jour.

Dept. Agr. P. R., Vol. 17, No. 3, pp. 197-198. San Juan, October 1933: 84.7% of 304 fields observed April 3 to 5, 1933 did not have trash burned.

reared from eggs of *Diatraea saccharalis* F. at Guánica



Trichogramma minutum Riley. Eighty-five times natural size. (Drawn by G. N. Wolcott.)

(112-11, 506-12, 172-13); from eggs of *Etiella zinckenella* Treit. at Loíza (80-33 Wolcott 34-431); from eggs of *Prenes ares* Felder (1222-13); from eggs of *Prenes nero* F. (15-13, 26-13 det. C. F. W. Muesebeck); from eggs of *Calpodes ethlius* Cramer (12-13 det. C. F. W. Muesebeck), at Pt. Cangrejos (190-15); from eggs of *Psara periusalis* Walker (624-17, 546-17).

Abbella sp.—det. C. F. W. Muesebeck
from *Ormenis* eggs (361-12).

TETRASTICHIDÆ

Tetrastichus antiguensis Crawford?—det. C. F. W. Muesebeck
from lepidopterous leaf-miner, *Tischeria heliopsisella* Chambers, on El Yunque (815-12).

Tetrastichus periplanetae Crawford—det. A. B. Gahan
from ? on *Pluchea* at Pt. Cangrejos (I No. 5551).

Tetrastichus hagenowi Ratz.—det. J. C. Crawford
Sein 23-5: a primary parasite of the egg masses of *Periplaneta americana* L. EEP-132: quoting Sein.
resting on *Hibiscus* (I No. 5288); at Mayagüez (I No. 5878);
71 adults from one cockroach egg-capsule (409-12, 333-22 det. A. B. Gahan).

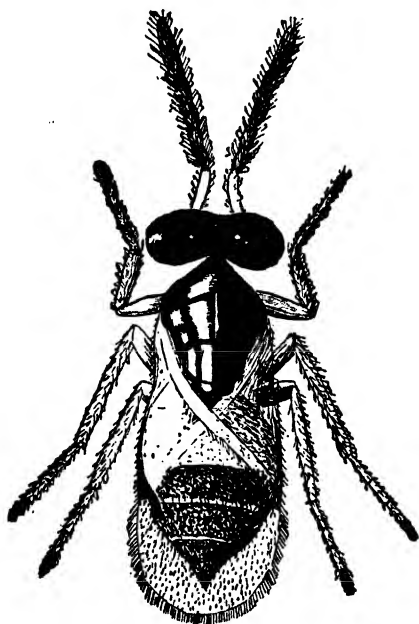
Tetrastichus haitiensis Gahan—det. A. B. Gahan

probably this sp. (as sp.) Wolcott 24-14, 19, 29: eaten by *Anolis evermanni*, *A. pulchellus* and *A. cristatus*.

Wolcott 33-269 & FEWI-141, 458: first found in P. R. in 1929.

Wolcott 33-46 & 34-92: a parasite on the eggs of *Diaprepes abbreviatus* L.

Tucker 34-16: attempt at introduction from Haiti and P. R. into Barbados a failure because the female wasp can not oviposit when the host eggs are laid between cane leaves.



Tetrastichus haitiensis Gahan. Sixty times natural size. (Drawn by G. N. Wolcott.)

Wolcott 34-426 to 427: "Few of the many egg clusters (of *Diaprepes abbreviatus* L.) laid in the late spring produce grubs, because of heavy parasitization by, but during the remainder of the year, this parasite is scarce."

from eggs of *Diaprepes abbreviatus* L. at Aguirre (H. T. Osborn), at Isabela (163-31), at Dorado (127-32, 1-33), at Florida (176-32), after the hurricane of San Ciprián not seen until December (167-32).

Tetrastichus periplanetae Crawford—det. A. B. Gahan

EEP-132: mention.

reared from egg-capsule of a cockroach (343-21).

Tetrastichus vaquitarum Wolcott (IP) 23-63: TYPE from P. R., reared from eggs of *Lachnopus coffeae* Marshall in the mountains north of Yauco (153-21 TYPE).



Tetrastichus vaquitarum
Wolcott. Fifty times
natural size. (Drawn
by G. N. Wolcott.)

Wolcott 22a-17 to 18, fig. 18, EEP-54 to 55 & EEWI-329: notes and figure.

Tetrastichus sp. nov.—det. A. B. Gahan
from coffee leaves from Lares (72-33).

Ceratoneura petiolata Ashmead—det. C. F. W. Muesebeck
reared from a weevil, *Hypocoeliodes* sp. or *Hypurus near*
bertrandi Perris, in *Portulaca* (512-12).

ENTEDONTIDÆ

Derastenus sp. near *fullawayi* Crawford—det. A. B. Gahan
reared from *Leucoptera coffeella* Guerin at Lares (72-33,
6-35).

Closterocerus sp. near *cinctipennis* Ashmead—det. A. B. Gahan
reared by F. Seín from *Leucoptera coffeella* Guerin at Lares
and Isabela (5-35).

Closterocerus leucopus Ashmead—det. A. B. Gahan
reared by F. Seín from *Leucoptera coffeella* Guerin at Lares
and Isabela (15-35).

Chrysocharis livida Ashmead

Barrett 05-397: a parasite of *Leucoptera coffeella*, the coffee leaf-miner, at Mayagüez. "black with purplish reflections from the thorax; the size about 1 mm.: it is very active."

Barrett 06-22: "throughout the island."

Van Zwaluwenburg 15-33: 30% of the pupae of *L. coffeella* parasitized at Mayagüez.

Van Zwaluwenburg 17-514: mention.

Wolcott 21a-8: illustration of adult, notes.

Leonard 32-128: 1% of parasitism of coffee leaf-miner at Lares, as determined by F. Seín.

reared from *Leucoptera coffeella* Guerin at Lares (8-35 det. A. B. Gahan).

Chrysocharis parksi Crawford—det. C. F. W. Muesebeck

reared from *Agromyza jucunda* (48-16); from *Agromyza pusilla* in pea leaves at Cidra (I No. 2006-B Leonard 33-122).

Horismenus apantelivorus Crawford—det. A. B. Gahan

(I No. 5551); from ? on *Pluchea* at Pt. Cangrejos (I No. 5526).

Horismenus cupreus Ashmead—det. A. B. Gahan

reared by F. Seín from *Leucoptera coffeella* Guerin at Lares (72-33, 13-35, 17-35).

Horismenus eudami Girault—det. C. F. W. Muesebeck

reared from larva of *Eudamus proteus* L. (99-16).

Horismenus pteromalis ("I believe it to be a MS name". A. B. Gahan)

Van Z. (5204) from undetermined Sphingid.

Horismenus sp.—det. J. C. Crawford

from seed pods of *Acacia farnesiana* infested with *Bruchus* sp. at Guánica (43-14), from pods of *Prosopis juliflora* (45-14).

Horismenus sp.—"very similar to (*Pseudomphale*) *graciliventris* (Girault)."—det. A. B. Gahan.

EEWI-141 & Wolcott 34-92: the following record.

from egg cluster of *Diaprepes abbreviatus* L. parasitized by *Tetrastichus haitiensis* Gahan, at Isabela, June 1932 (125-32).

Euderus sp. nov.—det. A. B. Gahan

from ? on *Pluchea* at Pt. Cangrejos (I No. 5518, 5530, 5551).

? **Proacrias coffeae** Ihering—det. A. B. Gahan

reared by F. Seín from *Leucoptera coffeella* Guerin at Lares and Isabela (17-35).

Euderomphale aleurothrix Dozier, H. L., (TYPE from Haiti) "Two Undescribed Chalcid Parasites of the Woolly White Fly, *Aleurothrixus floccosus* (Maskell), from Haiti." Proc. Ent. Soc.

Washington, Vol. 34, No. 7, pp. 118-122. Washington, D. C., October 1932: "A single female reared by the writer from the same host on *Lignum-vitae* at Central Aguirre, P. R., June 28, 1925 is undoubtedly the same species but the general color is a shade deeper."

Euderomphale vittata Dozier 33-86: reared from a large whitefly, *Aleurodicus antillensis* sp. nov. Dozier, on "maria" *Calophyllum antillanum*, TYPE from Santurce, P. R.

EULOPHIDÆ

Diaulinus insularis Gahan, A. B., Proc. U. S. National Museum, Vol. 48, p. 165. Washington, D. C., Dec. 16, 1914: from *Agromyza inaequalis* Malloch, TYPE from P. R.
from *Agromyza pusilla* in cohitre at Humacao (I No. 3301-B det. as "sp.").

SPALANGIDÆ

Spalangia sp.—det. J. C. Crawford
Wolcott 22d-18: reared from horn-fly pupae at Guánica by G. B. Merrill.

PTEROMALIDÆ

Pachyneuron allograptæ Ashmead—det. C. F. W. Muesebeck
from Syrphid fly puparium (447-12).

Pachyneuron eros Girault—det. C. F. W. Muesebeck
from mealybug (503-12).

Pachyneuron siphonophoræ Ashmead—det. C. F. W. Muesebeck
from aphids on okra (572-12).

Aplastomorpha calandraræ Howard
(as *Pteromalus*) Barrett 05-396: "a common parasite of the rice weevil, *Calandra oryzae*."

Pteromalus sp. ?—det. A. B. Gahan
on ? *Pluchea* at Pt. Cangrejos (I No. 5511, 5528, 5529).

Zatropis deuterus Crawford—det. A. B. Gahan
resting on guava at Bayamón (I No. 4532).

Neocatolaccus filia Girault, A. A. (MS name)
from pupa of *Agromyza caerulea* Malloch in seeds of morning glory (142-17).

Neocatolaccus near *filia*—det. A. A. Girault
from pupae of Agromyzid fly in seeds of *Sida rhombifolia* at Mayagüez (242-17).

Neocatolaccus livii Girault, A. A., Ins. Insc. Menstruus, Vol. 4, 1916, p. 111: reared from galls in sea-grape, *Coccoloba uvifera*, of *Ctenodayctylomia watsoni* Felt, TYPE from Porto Rico.
Wolcott 26-50: mention.

ELACHERTIDÆ

Ardalus antillarum Gahan, A. B., Proc. U. S. National Museum, Vol. 61, Art. 24, No. 2445, p. 20, 1922: "from larvae of *Prenes nero* Fabricius, May 10, 1921", TYPE from Caguas, P. R.

Jones & Wolcott 22-41: "The larvae—issue from the caterpillars and form naked black pupae nearby, sixteen individuals having been observed to come from one large larva."

Pachyscapa insularis Howard—det. C. F. W. Muesebeck
from caterpillar on beans at Loíza (8-13).

Grotiusomyia nigricans Howard—det. C. F. W. Muesebeck
Gahan, A. B., "Miscellaneous Descriptions and Notes on Parasitic Hymenoptera." Ann. Ent. Soc. Amer., Vol. 25, No. 4, pp. 736-757. Columbus, 1932: the following record.

from larva of *Lamprosema indicata* on lima bean (1 No. 1770).

Euplectrus comstockii Howard—det. C. F. W. Muesebeck
from cutworm (118-12).

Euplectrus plathypenae Howard—det. A. B. Gahan
from caterpillars on leaves of *Tribulus cistoides* (23-34);
resting on leaf of asparagus at Cidra (1 No. 2891).

Euplectrus spp. (presumably or probably one of the above)
Wolcott 21-38: on larva of *Laphygma frugiperda* S. & A.
Jones & Wolcott 22-44: on *Cirphis latiuscula* Herr. Sch.
on larvae of *Cirphis latiuscula* H. S. (23-13, 39-13), of
Xylomiges sunia Guenee (576-17, 131-16 determined by C. F.
W. Muesebeck as "sp. near *plathypenae*"), of *Autographa
rogationis* Guenee (303-16).

Zagrammosoma multilineata Ashmead—det. W. H. Ashmead
Barrett 06-22: a "rare parasite, strictly primary" of *Leucoptera coffeella*, the coffee leaf-miner.

Van Zwaluwenburg 15-33, 17-514: mention.

Wolcott 21a-8: illustration of adult, notes.

Zagrammosoma seini Wolcott sp. nov.

honey yellow wasps with median and dorso-lateral black stripes on the thorax, the latter normally becoming broader on the abdomen, the other fainter and interrupted, but some specimens have the abdomen banded with black.

from mines of *Leucoptera coffeella* Guerin on coffee at Lares (152-21, 14-35 generic determination by A. B. Gahan).

presumably this is the species referred to in all the records from P. R. given as *Z. multilineata* Ashmead.

Cirrospiloideus sp. nov.—det. A. B. Gahan

reared by F. Seín from *Leucoptera coffeella* Guerin at Lares
and Isabela (9-35, 10-35, 18-35).

Elachertus sp. nov.—det. A. B. Gahan

reared by F. Seín from *Leucoptera coffeella* Guerin at Lares
(72-33).

ELASMIDÆ

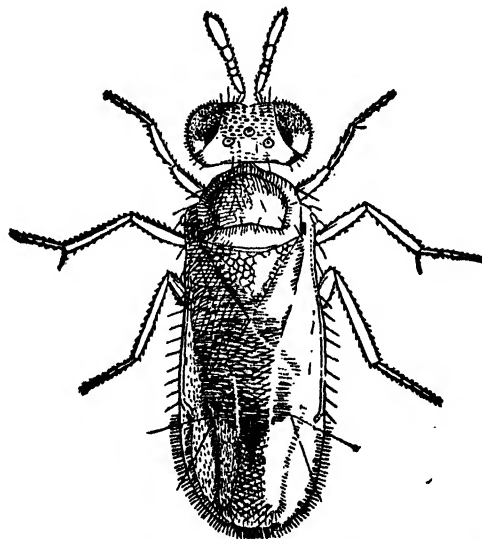
Elasmus maculatus Howard—det. C. F. W. Muesebeck

reared from cocoons of *Apanteles americanus* Lep. around
larvae of *Erinnyis ello* on yuca at Barceloneta (I No. 3359-B).

APHELINIDÆ

Aphelinus (Aphytis) chrysomphali Mercet—det. A. B. Gahan

Jones 17-11: from *Aspidiotus destructor* Signoret, det. Dr. L.
O. Howard as “apparently my *Aphelinus diaspidis*”.



Aphelinus chrysomphali Mercet. Seventy times
natural size. (Drawn by G. N. Wolcott.)

EEWI-359: illustration of adult; responsible for practical
control of scale on coconuts.

from *Aspidiotus destructor* Sign. (652-21, 482-13 det. L.
O. Howard as *A. diaspidis*); adults often noted in abundance
on scale-infested coconut palm leaves (GNW).

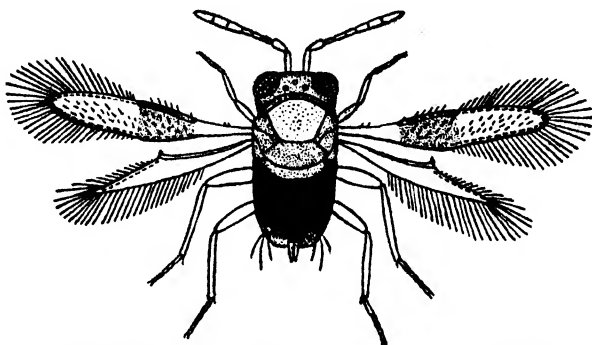
***Aspidiotiphagus citrinus* Craw**

Cranes, E. K., "Report on the Insectary Division for the Month of May, 1912." in Monthly Bull. State Comm. Hort., Vol. 1, No. 8, pp. 395-400. Sacramento, California, 1912: "From Prof. C. W. Hooker, Mayagüez, P. R.:

First Shipment: *Lepidosaphes beckii*, *Chrysomphalus aonidium*, *Aspidiotiphagus citrinus* issued in considerable numbers.

Second Shipment: same material.

Very few *A. citrinus* issued."



Aspidiotiphagus citrinus Craw. Greatly enlarged.
(Drawn by H. L. Dozier.)

Dozier 27-276: re-described and re-illustrated from material reared from *Asterolecanium pustulans* Ckll.

***Aspidiotiphagus lounsburyi* Berleze & Paoli—det. C. F. W. Muesebeck.**

(as *A. citrinus* Craw—det. L. O. Howard) Jones 17-9: from *Chionaspis citri* at Mameyes.

Dozier 27-277: re-described and figured from material reared from *Aspidiotus destructor* Sign. and *Diaspis pentagona* Targioni on mulberry.

reared from *Chionaspis citri* Comst. on ? at Mameyes (844-12 apparently originally determined by Dr. Howard as *A. citrinus* Craw, det. as above by C. F. W. Muesebeck).

***Encarsia basicincta* Gahan 27-20 to 21: TYPE from P. R., reared by H. L. Dozier from *Aleurothrixus floccosus* Maskell, Jan. 3, 1925.**

from woolly whitefly on grapefruit at Manatí (I No. 4717-B).

***Encarsia portoricensis* Howard 07-77: TYPE from P. R., reared by A. Busck from *Aleyrodes* sp. on climbing vine at Bayamón.**

Van Z. (5022) from *Aleyrodes* sp.

Trichaporus variegata Howard

(as *Encarsia*) Dozier, H. L., "An Undescribed White Fly attacking Citrus in Porto Rico." Jour. Agr. Research, Vol. 34, No. 9, pp. 853-855, fig. 3. Washington, D. C., May 1, 1927: "a single female (det. Gahan) reared from" *Paraleyrodes naranjæ* Dozier.

Dozier 33-92: generic transfer (which is not accepted as correct by Mr. A. B. Gahan, see his letter of June 14, 1935.)

Prospaltella brunnea Howard, L. O., Ann. Ent. Soc. Amer., Vol. 1, p. 283. Columbus, O., 1908: TYPE from Bayamón, P. R., reared by A. Busck as a parasite on *Aleyrodes* sp., in January 1899.

Prospaltella ciliata Gahan, A. B., "Miscellaneous Descriptions of New Parasitic Hymenoptera, with some Synonymical Notes." Proc. U. S. Nat. Mus., Vol. 71, Art. 4, No. 2676, pp. 1-39, pl. 1, fig. 3, ref. 8. Washington, D. C., 1927: TYPE from San Juan, P. R., reared from *Aleurodicus* sp.

Prospaltella diaspidicola Silvestri

Dozier 33-93: reared from *Aulacaspis pentagona* Targioni at Río Piedras in 1925.

Marietta busckii Howard, L. O., (as **Perrisopterus**) "New Genera and Species of Aphelininae." U. S. Dept. Agr., Bur. Ent., Technical Series, No. 12, pt. 4, p. 87. Washington, D. C., July 12, 1907: "from *Asterolecanium aureum* Boisduval, collected at San Juan, P. R., February 21, 1899, by A. Busck."

Dozier 33-87: from soft scale on citrus; from *Asterolecanium pustulans* on *Cassia fistula*; from *Ceroplastes cirripediformis* on passion vine, all in 1925.

Marietta pulchellus Howard—det. H. L. Dozier

from *Targionia biformis* Kkll. on maguey at Comerío (112-24).

Coccophagus lunulatus Howard

Dozier 26-118: an effective control of the soft brown scale, *Coccus hesperidum* L.

Eretmocerus portoricensis Dozier, H. L., "The Identity of Certain White Fly Parasites of the Genus *Eretmocerus* Hald., with Descriptions of New Species (Hymenoptera: Aphelininae)." Proc. Ent. Soc. Washington, Vol. 34, No. 7, pp. 112-118, fig. 1. Washington, D. C., October 1932: TYPE from P. R., reared from *Aleurothrixus floccosus* on almácigo at Bayamón and *lignum vitae* at Central Aguirre.

(as *E. californicus* Howard) Dozier in Cook & Dozier) 25-14: commercial control of woolly white fly of citrus by.

(as *E. californicus*) Dozier 26-122: "reared from the woolly white fly material on almácigo."

Pseudopteroptrix imitatrix Fullaway

Dozier 27-273: reared from *Howardia biclavis* on *Acalypha*.
from *Howardia biclavis* (659-12 det. C. F. W. Muesebeck).

Plagiomerus cyanea Ashmead

Dozier 27-273: re-described and illustrated from material reared from *lignum vitae* infested with *Ceroplastes cirripediformis* at Aguirre.

Aneristus ceroplastae Howard

Dozier 25-365: reared from *Pulvinaria iceryi* on sugar-cane at Arecibo; from *Ceroplastes cirripediformis* on *Ficus* sp. and passion vine at Bayamón; from *Saissetia hemispherica* on avocado; from *Eucalymnatus tessallatus* on *Calophyllum antillarum*.

EUCALYMNATUS

ENCYRTIDÆ

Acerophagus nubilipennis Dozier 26-101: TYPE from P. R., reared from *Pseudococcus adonidum* L. and *P. citri* Risso.

Aphycus flavus Howard—det. P. H. Timberlake

Dozier 25-362: reared from *Pulvinaria iceryi* at Arecibo.

Aphycus sp. nov., near **eruptor** Howard—det. C. F. W. Muesebeck
from *Ceroplastes cirripediformis* Comst. on *Myrcia paniculata* at Algarrobo (792-14).

Pseudaphycus sp. nov.—det. C. F. W. Muesebeck

Wolcott 34-98: reared while searching for the introduced *Pseudococcobius (Aphycus) terryi* Fullaway from Louisiana.
from *Pseudococcus sacchari* Ckll. (178-32), from *P. virgatus* Ckll. on grosella (55-33 det. A. B. Gahan).

Coccidoctonus trinidadensis Crawford—det. C. F. W. Muesebeck

from mealybugs on sugar-cane (188-12, 190-12, 185-12, 243-12).

Leptomastix dactylopii Howard

Dozier 27-267, 269: re-description, reared from *Pseudococcus citri* Risso, host of *Achrysopophagus seini* Dozier and *A. gahani* Dozier.

from mealybug on cacao (5-16); pupae found near *Pseudococcus citri* Risso on coffee (30-25 det. F. Seín); pupa in guava fruit (I No. 2127-B Leonard 33-116); on grapefruit at Palo Seco (I No. 2219).

Brethesiella sp. nov.—det. A. B. Gahan

from *Icerya montserratensis* R. & H. at Barceloneta (I No. 4720-C).

Euaphycus portoricensis Dozier 26-100: TYPE from P. R., reared from *Asterolecanium pustulans* on *Cassia fistula*, a primary parasite.

Paralitomastix sp. nov.—det. A. B. Gahan
Leonard & Mills 31-472 & Leonard 32-136: a parasite of *Brachyachma palpigera* Walsingham.

Copidosoma truncatellum Dalm.—det. C. F. W. Muesebeck
reared from caterpillar on sugar-cane (20-13), from larva of *Plusia rogationis* Guenee (10-16).

Homalotylus terminalis Say—det. C. F. W. Muesebeck
Leonard, M. D., "A Braconid Parasite on a Coccinellid New to Puerto Rico." Jour. Ec. Ent., Vol. 26, No. 1, p. 294. Geneva, N. Y., February 1933: parasitizing *Cycloneda sanguinea* L. (as *H. obscurus*) Jones 156-12: parasitic on *Cycloneda sanguinea* L. and *Megilla innotata* Vauls.
original of Jones' material (616-12 re-determined C. F. W. Muesebeck), (135-32).

Habrolepoidea celia Girault, A. A., TYPE from P. R.
from puparium of Syrphid fly, *Baccha latiuscula* (143-17), at Pt. Cangrejos (GNW).

Syrphophagus mesograptae Ashmead—det. C. F. W. Muesebeck
from Syrphid fly puparium on sugar-cane (730-12, 447-12), at Trujillo Alto (755-12, 757-12), on corn at Palo Seco (I No. 5899).

Isodromus sp.—det. H. L. Dozier
from *Chrysopa* pupa cases (33-25).

Encyrtus infelix Emb.—det. C. F. W. Muesebeck
on banana leaf at Guayama (I No. 3401).

Ageniaspis sp.—det. C. F. W. Muesebeck
resting on lima beans at Loíza (I No. 3780).

Aphidencyrtus sp.—det. C. F. W. Muesebeck
reared from ? (213-12).

Coccidencyrtus sp.—det. C. F. W. Muesebeck
reared from *Targionia sacchari* Ckll. (484-13).

Coccidoxenus portoricensis Crawford 13-249: TYPE from P. R.
Jones 17-2: from *Ceroplastes cistudiformis* T. & C.
from ? on gandul (I No. 5284).

Mercetiella reticulata Dozier 26-98: TYPE from P. R., reared from *Asterolecanium pustulans* on balsa tree and *Cassia fistula* on this host (865-14).

Cheiloneurus pulvinariae Dozier 25-363: TYPE from P. R., reared from *Pulvinaria iceryi* Guerin on sugar-cane at Arecibo, a hyperparasite on the primary parasite of this scale, *Aphycus flavus* Howard.

Wolcott & Seín 33-213: the following data:

reared from *Icerya purchasi* Maskell (123-32 det. C. F. W. Muesebeck), from *Icerya montserratensis* R. & H. at Cabo Rojo (25-34 det. A. B. Gahan).

Arrhenophagus chionaspidis Aurivillius—det. A. A. Girault
Jones 17-18, 11: the following records:

from *Hemichionaspis minor* on verbena (321-12), from *H. minor* and *Saissetia nigra* on cotton at Ensenada (481-13 det. L. O. Howard).

Procheiloneurus sp. nov.—det. A. B. Gahan
from ? on citron at Ponce (I No. 341).

Achrysopophagus gahani Dozier 27-270: TYPE from P. R., reared from *Pseudococcus citri* Risso on croton parasitized by *Leptomastix dactylopii* Howard.

Achrysopophagus seini Dozier 27-269: TYPE from P. R., same data as for *A. gahani*.

Hunterellus hookeri Howard—det. J. C. Crawford
(I No. 2126 Leonard 33-136); running about in hairs on dog (707-13); reared from tick, *Dermacentor nitens* Newman (358-12).

SIGNIPHORIDÆ

Thysanus bifaciatus Ashmead—det. A. B. Gahan
Dozier 27-272: reared by F. Seín from parasitized *Pseudococcus citri* Risso.

Thysanus fax Girault, A. A., Proc. U. S. Nat. Mus., Vol. 45, p. 223.
Washington, D. C., 1913: TYPE from San Juan, P. R., a parasite of *Chrysomphalus personatus* Comstock.
from *Chrysomphalus personatus* Comstock on *Ficus nitida* in the plaza of Río Piedras, P. R. (483-13 TYPE ?, det. as above, C. F. W. Muesebeck).

Thysanus flavus Girault
Dozier 27-272: reared from lignum vitae material infested with *Aleurothrixus howardi* at Central Aguirre.

Thysanus nigrus Ashmead
Dozier 27-271: reared from *Pseudococcus citri* Risso on croton.

CALLIMOMIDÆ

Colostichus biannulatus Mayr—det. C. F. W. Muesebeck
infesting fruits of *Piper* at Cidra (I No. 1631 Leonard
33-131).

EUP'ELMIDÆ

Anastatus viridicaput Gahan, A. B., *Memorias de la Sociedad Poey*,
Universidad de la Habana, Vol. 8, p. 129. Habana, 1934:
TYPE from P. R., reared from Mantis eggs, Jan. 4, 1923
(GNW).

Eupelmus allynii French—det. A. B. Gahan
(I No. 5551), from ? on *Pluchea* (I No. 5527 det. as "sp.").

Eupelmus coccidivorus Gahan—det. C. F. W. Muesebeck
from *Saissetia nigra* and *Hemichionaspis minor* on cotton at
Ensenada (481-13).

Eupelmus saissetiae Silvestri
Dozier 27-272: an important factor in the control of the Black
Scale, *Saissetia oleae*; illustrations of larva and pupa.

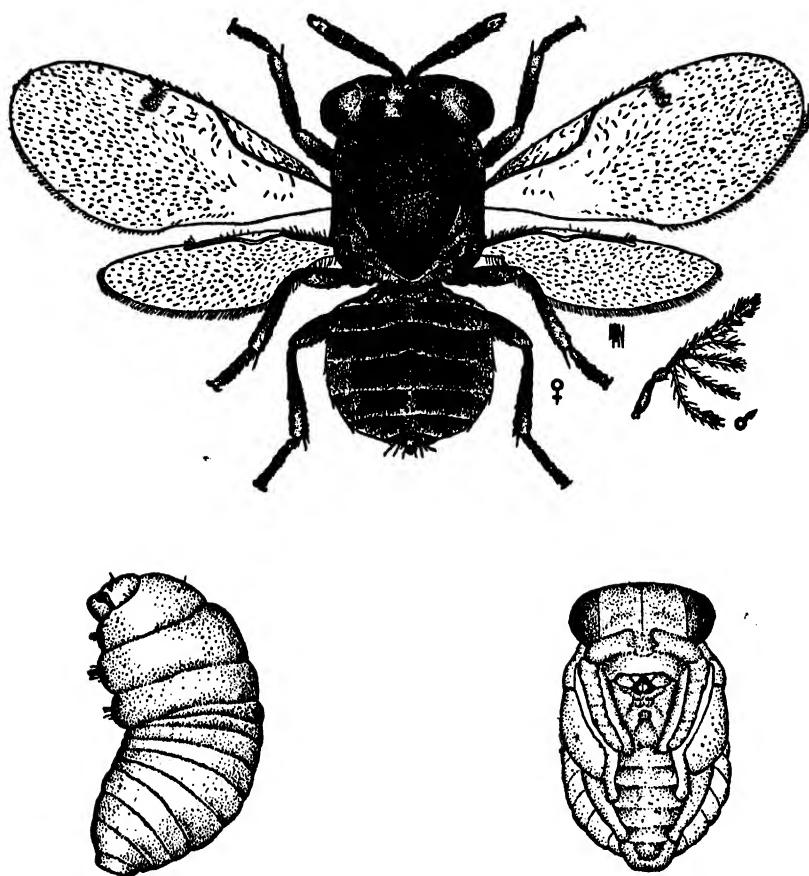
Lecanobius cockerellii Ashmead
Ashmead 00-341: from P. R.
Dozier 26-119: holding *Saissetia oleae* in check.
Dozier 27-272: reared from *Saissetia oleae* on avocado.

Zaischnopsis sp.—det. A. B. Gahan
in orange grove at Consumo (I No. 1474).

Tanaostigmodon portoricensis Crawford 13-247: TYPE from P. R.
Van Z. (P. R. 1623) from seed pods of *Inga laurina*.

EURYTOMIDÆ

Tanaostigma haematoxyli Dozier—det. H. L. Dozier
abundant in seed pods of "campeche", *Haematoxylon cam-*
pechianum at Mayagüez. (H. L. Dozier.)



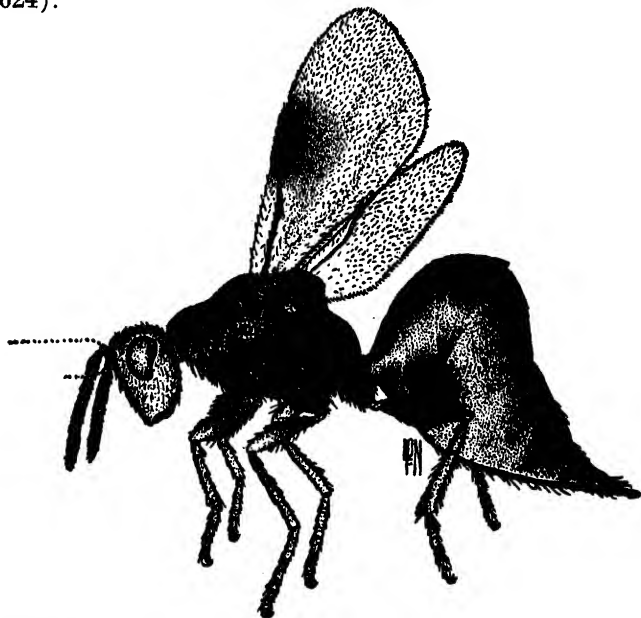
Tanaostigma haematoxyli Dezier: female above, about fifty times natural size; antenna of male; fully-grown larva and pupa below. (Drawn by L. Pierre-Noël.)

Bephrata cubensis Ashmead—det. C. F. W. Muesebeck

Dozier, H. L., "Two Important West India Seed-Infesting Chalcid Wasps." Jour. Dept. Agr. P. R., Vol. 16, No. 2, pp. 103-112, fig. 5, ref. 2. San Juan, July 1932: reared from fruit of *Annona muricata* in 1925.

EEWI-521: life-history and hosts.

reared from fruit of *Annona reticulata* at Villalba (I No. 1624).



Bephrata cubensis Ashmead, female. About one hundred times natural size. (Drawn by L. Pierre-Noël.)

Eurytoma ctenodactylomyii Girault, A. A., Ins. Insc. Menstruus, Vol. 4, p. 111. Washington, D. C., 1916: from galls in sea-grape of *Ctenodactylomyia watsoni* Felt: TYPE from P. R.

MISCOGASTERIDÆ

Lelaps spp. nov.—det. A. B. Gahan

in orange grove at Mayagüez (I No. 4817), another undescribed species (female) at Arecibo (I No. 5434); a male on pomarrosa at Bayamón (I No. 5328).

Halticoptera (?) *aenea* Walker—det. A. B. Gahan

reared from flowers of *Bidens pilosa* at Dorado (I No. 5001), at Guayama (I No. 5020, 5021, 5039, 5042); reared from *Agromyza jucunda* V. d. W. (48-16, originally determined by C. F. W. Muesebeck as *Cyrtogaster liqueata* Ashmed, re-determined by him in 1935 as above).

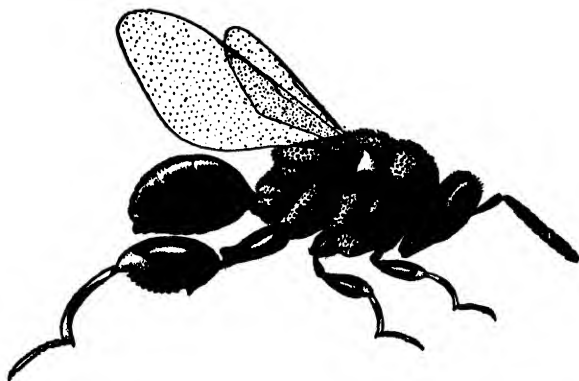
PERILAMPIDÆ

Perilampus hyalinus Say—det. A. B. Gahan
on flowers at Bayamón (I No. 5533).

Perilampidea larium Wolcott (IP) 23-60: TYPE from Lares, P. R.,
from pupa of *Baccha clavata* F. at Lares (428-21 TYPE).

CHALCIDIDÆ

Chalcis sp. nov.—det. A. B. Gahan
on weeds at Pt. Cangrejos (I No. 5468).



Brachymeria incerta Cresson. Ten times natural size.
(Drawn by F. Maximilien.)

Brachymeria incerta Cresson

(as *Chalcis annulata* F.) Barrett 06-23: from pupae of *Alabama argillacea*.

(as *Chalcis*) Gundlach (det. Cresson).

(as *C. sp.*) Wetmore 16-89: eaten by Martin.

Van Z. (5020) from pupae of *Pieris monuste* L., *Calpodus ethlius*

Cr. and *Megalopyge krugii* Dewitz.

(as *C.*) Wolcott 24-56: checking *Alabama* outbreak at Boquerón
and Camuy.

AMC: at many localities.

adult swept from grass (79-12); reared from *Mesoncondyla concordalis* Hübner (693-17), from chrysalis of *Eantis thraso* Hübner at Lares (406-22), from *Homaledra sabalella* Chambers, the coconut leaf caterpillar (136-23), from pupa of *Phiprosopus alboguttatus* H. S. at Boquerón (116-23), from *Mocis repanda* F. at Aguadilla (156-31), at Arecibo (361-23); from pupae of *Alabama argillacea* Hübner at Vega Baja (275-23), at Camuy (208-22), at Boquerón (24-23), in the latter case, of a large number of pupae collected, all were parasitized, and this parasite was undoubtedly responsible for checking the extensive outbreak.

Brachymeria ovata Say—det. C. F. W. Muesebeck
at Mayagüez (I No. 2548 Leonard 33-131).

(Chalcis restituta Walker
Gundlach, "con duda" — det. Cresson.)

Brachymeria robusta Cresson
(as *Chalcis*) Gundlach, "de los contornos de Mayagüez."
Ashmead.
one specimen from *Mocis repanda* F. at Boquerón (341-23).

Brachymeria robustella (as *Chalcis*) Wolcott, (IP) 20-56: TYPE
from Río Piedras, P. R.

(as *C. near robusta* Cresson) Jones & Wolcott 22-49: from
Remigia repanda F.

from cocoons of *Megalopyge krugii* Dewitz (38-21 TYPE);
from pupae of *Remigia repanda* Fabr. at Guánica (656-14, the
yellow spot on posterior femora of these specimens extends
over half way towards the base on the anterior margins, also
to the apex, and the tibiae are all yellow), at Boquerón (341-
23); from *Neonympha* pupa at Guánica, parasitized July 25,
1:42 PM, adult issued Aug. 6, 4:00 PM (E. G. Smyth), (ap-
proaching *C. incerta* Cresson, with silvery pubescence and
small areas of black appearing on the tibiae, but the yellow
areas are bright and intense); resting on *Conocarpus erecta*
at Arecibo (361-23); resting on guava at Peñuelas (I No.
3033).

Brachymeria sp.—det. A. B. Gahan
in orange grove at Trujillo Alto (I No. 493).

Spilochalcis femorata F.

Van Z. (P. R. 49). (as sp.) Wetmore 16-61: eaten by Ani.
Wolcott 24-20, 29: eaten by *Anolis pulchellus* and *A. cristatellus*.

(I No. 911, 2701); swept from grass at Morovis (GNW),
from carrots (549-17, 691-17); on corn at Guánica (431-14);
on almendra at Arecibo (I No. 5368), at Rincón (I No. 4002);
on guava at Peñuelas (I No. 3030); on maga flowers at Ba-
yamón (I No. 256 as "sp." 2882); reared from *Psara bi-
punctalis* F. (655-16).

Spilochalcis syrphidis Wolcott (IP) 23-57: TYPE from Caguas, P. R.
from puparia of Syrphid flies, *Toxomerus polygonastyla*
Metcalf MS, on tobacco at Caguas (121-21 TYPE); swept
from carrots (690-17).

Spilochacis homaledrae Wolcott (IP) 23-58: TYPE from Río Pie-
dras, P. R.

from coconut palm fronds infested with *Homaledra sabalella*
Chambers (137-23 TYPE, I No. 2721).

Spilochalcis cocois Wolcott (IP) 23-58: TYPE from Río Piedras, P. R.

from coconut palm fronds infested with *Homaledra sabalella* Chambers (106-23 TYPE); (near *cocois*) on corn at Isabela (107-31).

Spilochalcis sp. nov.—det. A. B. Gahan

from Dryinid parasitic on *Ormenis* sp. and *O. infuscata* Stal on grapefruit at Manatí (71-33), at Arecibo (I No. 5669 as "sp.").

Smiera cressoni Howard—det. A. B. Gahan

from pupa of *Oxyptilus* sp. on *Caperonia regalis* (588-12).

Smiera emarginata Fabr.

Gundlach, "rara." Ashmead. Dewitz.

Smiera (Tetrasmiera) eubule Cresson

Van Z. (P. R. 59).

from pupa of *Callydrias eubule* Linn. (160-12), at Guánica (202A-15): (160-12) differs from Cresson's description in that all markings on thorax and legs are black, and in addition has a black petiole to the abdomen, but (202A-15) has some of its markings ferruginous and the petiole is yellow, and as they are from the host recorded by Cresson, probably represent a more melanic variation of the Cuban species.

Smiera flavopicta Cresson

Gundlach, "común." Ashmead. Dewitz.

Smiera ignea Cresson

Gundlach, "rara." Ashmead. Dewitz.

Smiera punctata Fabr.

Gundlach, "Las larvas de todas las especies de esta familia se crían dentro del cuerpo de orugas y larvas, o crysálidas y ninfas."

Dewitz.

PROCTOTRUPOIDEA (SERPHOIDEA)

CALLICERATIDÆ

Calliceras sp.—det. C. F. W. Muesebeck

from *Pluchea* at Pt. Cangrejos (I No. 5551).

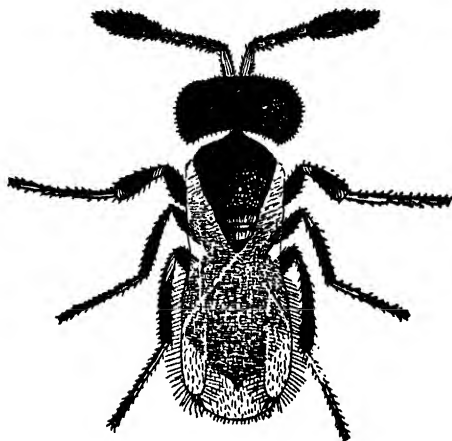
Aphanogmus sp. nov.—det. C. F. W. Muesebeck

from *Pluchea* at Pt. Cangrejos (I No. 5551).

SCELIONIDÆ

Prophanurus alecto Crawford—det. A. B. Gahan

Wolcott 22e-24: a parasite of the eggs of *Diatraea saccharalis* F., notes, a short description and illustration of adult.



Prophanurus alecto Crawford. Eighty-five times natural size. (Drawn by G. N. Wolcott.)

EEWI-176 to 17: same data and illustration.

from eggs of *Diatraea saccharalis* Fabr. (234-21), at Toa Baja (336-21).

Phanurus flavus, Dodd, Alan P., "A New Proctotrypoid Egg-parasite from the West Indies (Hym.)" in *Entomological News*, Vol. 25, p. 350, October, 1914, TYPE from Porto Rico.

EEWI-322: the same data.

from eggs of *Ormenis pygmaea* Fabr. (360-12 TYPE), a common parasite.

Hadronotus carinatifrons Ashmead—det. C. F. W. Muesebeck from Coreid eggs at Canóvanas (505-12).

Telenomus sp.—near **convergens** Ashmead—det. C. F. W. Muesebeck reared from *Leucoptera coffeella* Guerin from Lares and Isabela by F. Seín (7-35).

Telenomus flaviventris Ashmead—det. C. F. W. Muesebeck reared from eggs of *Ormenis* sp. on sugar-cane by Thos. H. Jones (634-12, 676-12).

Telenomus sp. nov.—det. C. F. W. Muesebeck reared from eggs of *Ormenis* sp. by Thos H. Jones (205-12, 340-12).

Telenomus sphingis Ashmead

Gahan, A. B., "Synonymical and Descriptive Notes on Parasitic Hymenoptera." Proc. U. S. Nat. Mus., Vol. 77, Art. 8, No. 28313, pp.-11. Washington, 1930.

(as *T. monilicornis* Ashmead—det. J. C. Crawford) Tower 08-35; Tower 10-27; Wolcott 22c-8; EEP-88: reared from eggs of *Phlegethontius sexta* Johan.

PLATYGASTERIDÆ

Leptacis sp. nov.—det. C. F. W. Muesebeck
on canna (I No. 5287).

FORMICOIDEA

Wheeler, Wm. M., "The Ants of Porto Rico and the Virgin Islands." Bull. Amer. Mus. Nat. Hist., Vol. 24, Art. 6, pp. 117-158, fig. 4, pl. 2. New York, 1908.

Wheeler, Wm. M., "Ants." pp. xxv & 663, fig. 285, ref. 70 pp. Columbia University Press, New York, March 1910.

Wolcott, G. N., "Recent Experiments in the Control of Puerto Rican Ants." Jour. Dept. Agr. P. R., Vol. 17, No. 3, pp. 223-239, ref. 6. San Juan, November 14, 1933.

(The first draft of this section was prepared by Mr. J. D. More; the determinations of the ants eaten by lizards were made by the compiler. To the American Museum of Natural History the compiler is indebted for permission to reproduce the illustrations from Dr. Wheeler's papers; all such illustrations being here noted as "Drawn by R. B. Howe.")

PONERINÆ

Platythyrea punctata F. Smith

Wheeler: between Arecibo and Utuado, "in a shady cafetal."
on *Caladium* at Arecibo (I No. 5442).

Euponera (Pseudoponera) stigma Fabr.

Wheeler: in Culebra Island and at Utuado, "nesting under stones or logs."
on orange leaves at Ponce (I No. 3222).

Ponera opaciceps Mayr

Wheeler: on Culebra Id., at Utuado, Monte Morales, Monte Mandios and at Coamo Springs, "under bark of decaying logs in damp places."

Wetmore 16-87: eaten by Swallow.

(as sp.) Wolcott 24-4: three individuals in 3 sq. ft. of pasture at Pt. Cangrejos.

Ponera ergatandria Forel

Wheeler: at Utuado.

Anochetus mayri Emery

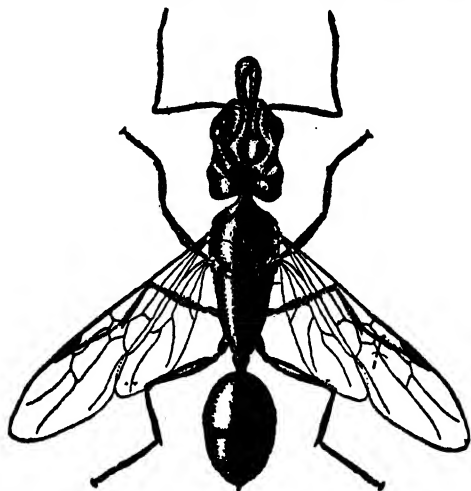
Wheeler: at Utuado, Vega Baja, Monte Morales and Monte Mandios, at Coamo Springs, San Juan, Adjuntas, Arecibo, "common under dead leaves and stones in the shade of cafetals and platanals."

Wolcott 24-16, 28: eaten by *Anolis pulchellus* and *A. cristatellus*.

Anochetus (Stenomyrmex) emarginatus testaceus Forel

Wheeler: on Culebra Id., "along dry arroyos on the higher part of the island."

on grapefruit at Palo Seco (I No. 5398—det. Mann).



Odontomachus haematodes L., winged adult.

Five times natural size. (Drawn by
F. Maximilien.)

Odontomachus haematodes Linn.

Wheeler: at many localities, "common, nesting under stones or logs or in untidy mound nests about the roots of trees, but only in shady places and rather rich soil."

Wetmore 16-80: eaten by Petcharv.

Wolcott 24-16, 19, 28, 33: eaten by *Anolis pulchellus*, *A. cristatellus* and *A. gundlachi*. Wolcott 33-223: "barraco".

AMC: many localities.

(I No. 879—det. Mann), at light (I No. 3131); at Ciales in rotten stump (59-21).

Odontomachus heamatodes Linn., subsp. *insularis* Guerin, var. *ruginodis* Wheeler—popularly known as "berraco".

Wheeler: at Utuado, Adjuntas, Coamo Springs, "less common—in open sunny places in sandy soil of river bottoms."

Wetmore 16-91: eaten by Mockingbird.

(705-16, 1117-16), at base of tree (267-12), in rotten coconut husks (183-21), with *Pseudococcus sacchari* Ckll. under leaf-sheaths of sugar cane (162-11); at roots of sugar cane at Guánica (226-11), on Vieques Id. (GNW); on sugar cane at Guayanilla (GNW); at light, second story of house (32-24).

Odontomachus haematoda L. var. **notata** Mann, W. M., "Addition to the Ant Fauna of the West Indies and Central America". Bull. Amer. Mus. Nat. Hist., Vol. 42, Art. 8, p. 404. New York, 1920: TYPES from Monte Mandios, P. R. (Wheeler collection).

MYRMICINÆ

Cerapachys (Syscia) seini Mann, Wm. M., "Entomology—a New Ant from Porto Rico." Jour. Washington Academy Sci., Vol. 21, No. 17, pp. 440-441, fig. 1. Washington, D. C., October 19, 1931: TYPE from among roots of sugar-cane in P. R. Seín 30-175: feeding on larvae of *Perforadix sacchari* Seín.

Pseudomyrma flavidula F. Smith
Wheeler: a single worker at Tallaboa.

Pseudomyrma flavidula Smith, var. **delicatula** Forel—det. Wheeler
Wolcott 24-54: on coffee.
on trunk of rotten tree and on sugar cane (323-12); on coffee tree at San Germán (399-21); on cotton at Pt. Cangrejos (605-22); in termite nest at Ciales (612-22); on grapefruit at Arecibo (1 No. 5370).

Monomorium destructor Jerdon
Wheeler: "a single colony nesting at the base of *Acacia farnesiana* tree at Tallaboa." Van Z. (P. R. 1013).
Wolcott 24-19: eaten by *Anolis pulchellus*.

Monomorium minutum Mayr
Van Z. (P. R. 622).

Monomorium pharaonis Linn.
Wheeler: "common in houses and hotels—also nesting out of doors in the ground on Culebra Id."
Van Z. (P. R. 1014).
Wolcott 24-16: eaten by *Anolis pulchellus*.
Wolcott 24-3: seven individuals in 3 sq. ft. of pasture at Pt. Cangrejos.
in houses (153-11, 681-12).

Monomorium carbonarium F. Smith, subsp. **ebeninum** Forel
Wheeler: on Culebra Id., and at many places in Porto Rico "under stones, in Tillandsias and under bark."
Van Z. (P. R. 322).
Van Dine 13-32, Jones 16-15, Colón 19-30: attending *Sipha flava* Forbes on sugar cane.

(as sp.) Wolcott 24-25, 28: eaten by *Anolis stratulus* and *A. cristatellus*.

nesting under leaf-sheaths of sugar cane (161-11), in tunnel of *Diatraea saccharalis* Fabr. in sugar cane (204-11), attending *Sipha flava* Forbes on young sugar cane (328-12, 333-12), on seed cane (721-12)—all det. Wheeler—nesting in cabbage head (408-19) tunneling among the inner leaves; under cow dung (268-12); attacking larva of *Desmia ufeus* Cramer (601-21); attending *Sipha flava* Forbes on sugar cane at Guánica (227-15); on coffee at San Sebastián (604-21); "injurious to the fruits of roselle, *Hibiscus sabdariffa*, by nesting in them." E. G. Smyth.

Monomorium floricola Jerdon

Wheeler: "common in Tillandsias, under bark-scales of trees and in hollow twigs."

Van Z. (P. R. 1015).

Wetmore 16-63: eaten by Woodpecker.

(142-11), carrying away dead flies (455-12), on cotton (355-21): in tunnel of *Diatraea saccharalis* Fabr. in sugar cane at Humacao (51-13); nesting in hollow twigs on coffee at Lares (151-20), at Peñuelas (397-21), at Sabana Grande (398-21), at San Germán (400-21), in empty cocoon of *Megalopyge krugii* Dewitz on coffee at Caguas (112-21); in native lima bean pods at Manatí (I No. 3676).



Cardiocondyla emeryi

Forel. (Drawn by
R. B. Howe.)

Cardiocondyla emeryi Forel

Wheeler: on Vieques and Culebra Ids., and at many places in Porto Rico, "The colonies—are small and in sandy places, especially in river or creek bottoms and on sea beaches."

Wetmore 16-63: eaten by Woodpecker.

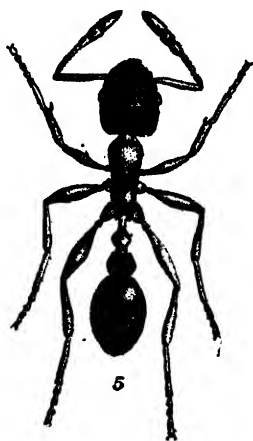
Wolcott 24-14: eaten by *Anolis pulchellus*.

Cardiocondyla venustula Wheeler 08-128: TYPE from Coamo Springs, P. R.; in small colonies in sandy and gravelly beds of streams or on sea-beaches. Also from Culebra Id. Illustration of worker.

Wheeler 10-126: same illustration.

Wetmore 16-87: eaten by Swallow.

Wolcott 24-14: eaten by *Anolis pulchellus*.



Cardiocondyla venustula

Wheeler. (Drawn by
R. B. Howe.)

Solenopsis geminata Fabr., the "hormiga brava".

Barrett, O. W., "Control of the Brown Ant (*Solenopsis geminata* Fabr.) in Orange Orchards." Circ. 4, P. R. Agr. Expt. Station, May 9, 1904. pp. 1-3.

Barrett 05-388: injurious to citrus trees.

Tower, W. V., "Control of the Brown Ant (*Solenopsis geminata* Fabr.) and the Mealy Bug (*Pseudococcus citri* Risso) in Pineapple Plantations." Circ. 7, P. R. Agr. Expt. Station, p. 3. Mayagüez, 1908 (reprinted in Wolcott 33-224 to 226).

Wheeler: "commonest of all the ants—except in—Culebrita. —This ant not only stores up seeds in its nests and is highly carnivorous, but it also attends aphids and coccids." With *Aphis nerii* Boyer on milkweed at Culebra.

Wheeler 10-126: on Culebra Id.

Tower 11a-11: injury to citrus groves and methods of control. Van Dine 11-29; Van Dine 12-20; Van Dine 13-30: attending *Pseudococcus sacchari* Ckll. on sugar cane.

Van Dine 13-32; Jones 15b-15: attending *Sipha flava* Forbes on sugar cane.

Jones 15b-17: attending *Aphis setariae* Thos. on sugar cane.

Van Z. (P. R. 311).

Jones 15-9: injuring okra plants.

Wetmore 16-40, 61, 66, 74, 116, 119, 128: eaten by Killdeer, Ani, Tody, Mango, Oriole, Mozambique, and Grasshopper Sparrow.

Cotton 18-296: injuring eggplant.

Colón 19-32: summary of injuries.

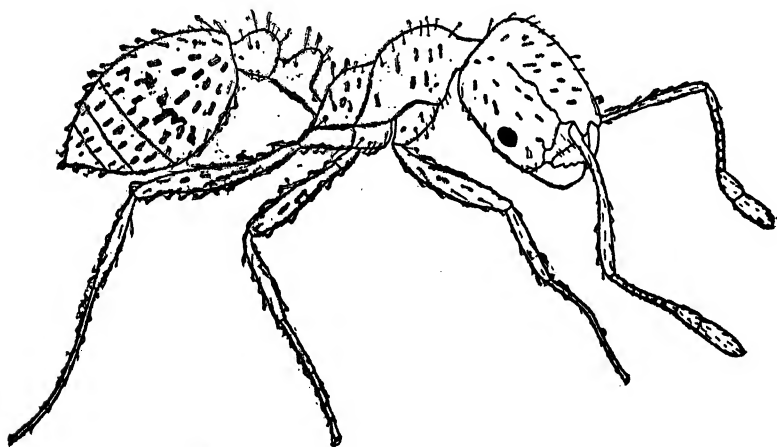
Wolcott 22-10: protecting aphids.

Smyth 19-138: "injures citrus, cowpeas, eggplants and bananas."

Wolcott 24-54: in coffee.

Wolcott 24-3: one hundred twenty-two individuals in 3 sq. ft. of pasture at Pt. Cangrejos.

EEP-67, 104: on citrus, on eggplant—economic accounts.



Solenopsis geminata F., worker. (Drawn by F. Seín.)

Díaz, M. A., "Resultados de la Demostración No. 33: Exterminio de Hormigas". Rev. Agr. P. R., Vol. 14, No. 1, pp. 38-39. San Juan, 1925: control of "hormiga brava" in a tobacco seed-bed.

Wolcott 24-11, 16; 25, 28: eaten by *Ameiva cxsul*, *Anolis pulchellus*, *A. stratulus* and *A. cristatellus*.

Hoffman 32-726: attending Cottony Cushion scale.

Leonard 32-126, 137: on citrus and pineapples.

Leonard 33-122: on pineapples.

Wolcott & Seín 33-218: attending Cottony Cushion Scale.

EEW1-464 to 467: control with crude carbolic acid emulsion (after Tower), and thallium sulfate only in houses.

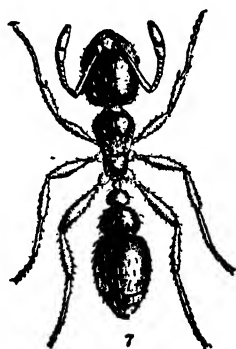
Wolcott 33-224 to 232: experiments in control with thallium, successful in the house, crude carbolic acid emulsion best in the field. Wolcott 34-94: summary of the above.

attending *Pseudococcus sacchari* Ckll. on sugar cane (147-11, 595-12), at Guánica (288-11); attending *Pseudococcus nipae* Mask, on *Psidium guajava* (270-12); attending *Saissetia hemisphaerica* Targ. on coffee at Lares (162-20); attending *Toxoptera aurantiae* Boyer on maney at Ciales (602-21); attending *Sipha flava* Forbes on sugar cane (330-12) and *Aphis setariae* Thos. on sugar cane (92-13); with *Liburnia* sp. on Guinea grass (108-12); carrying off dead insects (63-10); attracted by juice from freshly-cut sugar cane (720-12), of corn (331-21), of bean (784-14); injuring corn (154-11), eggplant (180-16, 483-16); at base of palm (342-21); in tobacco seed beds at Caguas (24-10); forming shelters over Cottony Cushion scale on grapefruit trees after hurricane of San Ciprián at Dorado (154-32); on ginger at Cabo Rojo (I No. 743); attending aphids on lima beans at Loíza (I No. 1671); attending *Toxoptera aurantiae* on grapefruit at Bayamón (I No. 812); piling up dirt around dahlias (20-33); at Aguas Buenas (I No. 1198); at Adjuntas (I No. 5194).

var. *rufa* Jerdon—det. S. A. Rohwer.

in asparagus at Palo Seco (I No. 452)*; on eggplant at Manatí (I No. 585).

***Solenopsis globularia* F. Smith, var. *borinquensis* Wheeler 08-131.** TYPE of var. from El Morro at San Juan, Porto Rico, and from Culebra Id.; nesting "in the white sand of the sea-beaches just above high-water mark". Illustration of worker. Wetmore 16-93: eaten by Thrush.



Solenopsis borinquensis
Wheeler. (Drawn by
R. B. Howe.)

***Solenopsis globularia* var. *desecheonis* Mann, Wm. M., "Additions to the Ant Fauna of the West Indies and Central America". Bull. Amer. Mus. Nat. Hist. Vol. 42, Art. 8, p. 428. New York, 1920: TYPE from Desecheo Id.**

Solenopsis corticalis Forel

Wheeler: in the stem of a bamboo at Utuado.

Solenopsis picea Emery

Wheeler: under bark of rotten log at Utuado.

Solenopsis azteca Forel, var. **pallida** Wheeler 08-131, TYPE of variety from Coamo Springs, P. R.; "a small nest under a boulder in a dry stream bed".

Cremastogaster victima F. Smith, var. **steinheili** Forel

Wheeler: "common—under bark or in hollow twigs:" Sheds built over coccids on leaves of *Cordia macrophylla* by colonies at Culebra Id.

Wheeler 10-223: construction of "carton nests" on Culebra Id. attending mealy-bugs on *Croton* at Yauco (600-22); attending *Toxoptera aurantiae* Boyer on mamey at Plantaje (603-22); on cotton at Villalba (609-21); in dead coffee twigs at Guayama (111-21); nesting in old cocoons of *Megalopyge krugii* Dewitz on citrus tree at Fajardo (468-12).

Pheidole fallax jelskii Mayr var. **antillensis** Forel

Wheeler: at many places in Porto Rico and on Culebra Id. Van Z. (P. R. 1018).

Wetmore 16-91, 93, 119: eaten by Mockingbird, Thrush and Mozambique.

Wolcott 24-16, 19, 22, 25, 28: eaten by *Anolis pulchellus*, *A. krugii*, *A. stratulus*, and *A. cristatellus*.

nesting under cement walk (159-11); nesting in cane field and attacking live changa, *Scapteriscus vicinus* Scudder, at Sardinera, Toa Baja (163-20); attacking live female wasp, *Campsomeris dorsata* Fabr. at Yauco (135-21):

Pheidole megalocephala Fabr.

Wheeler: at many places in Porto Rico, and on Culebrita Id.

Wheeler 10-155: absent in Culebra Id., abundant in Culebrita. Van Z. (P. R. 1020).

attending *Pseudococcus* sp. (609-12), attacking caterpillars (736-19), driving away *Solenopsis geminata* Fabr. (GNW); in ginger roots (I No. 770); attending aphids on lima beans at Loiza (I No. 1607); at Arecibo (I No. 4396).

Pheidole subarmata Mayer, var. **borinquensis** Wheeler 08-133:

TYPE of variety from P. R.; "only a few soldiers and workers in a colony—in sandy, sunny places like roads and creek bottoms". Illustrations of soldier and worker.

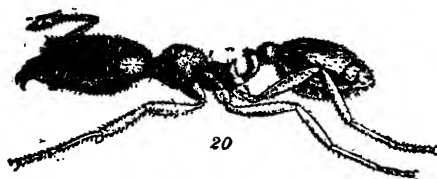
Wheeler 10-99: same illustrations.

Wetmore 16-129: eaten by Grasshopper Sparrow.

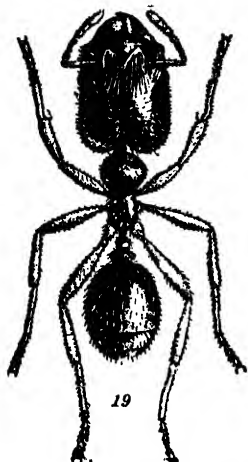
Wolcott 24-28: "or some other species of *Pheidole* than *antillensis*" eaten by *Anolis cristatellus*.

Pheidole flavens sculptor Forel

Wheeler: a single soldier at Coamo.



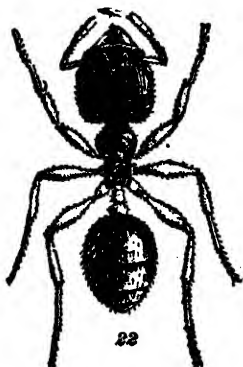
Pheidole borinquensis Wheeler: soldier.
(Drawn by R. B. Howe.)



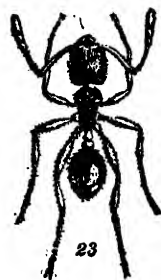
Pheidole borinquensis
Wheeler: soldier.
(Drawn by R.
B. Howe.)



Pheidole borinquensis
Wheeler: worker.
(Drawn by R. B.
Howe.)



Pheidole moerens Wheeler:
soldier. (Drawn by
R. B. Howe.)



Pheidole moerens
Wheeler: worker.
(Drawn by R.
B. Howe.)

Pheidole flavens exigua Mayr

Wheeler: redescribed. "Colonies—under logs and stones in open woods and cafetales." At Utuado and Coamo.
on *Inga vera* at Cayey (619-22).

Pheidole moerens Wheeler 08-136, TYPE from Utuado, Porto Rico, from under stones and prostrate plantain trunks in the woods and cafetals. Illustrations of soldier and worker.

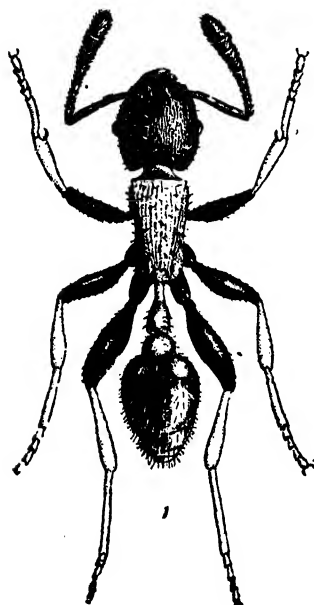
Macromischa isabellae Wheeler 08-138, TYPE from Monte Morales and Monte Mandios, Porto Rico, from colonies under the roots of an epiphytic orchid and in a hollow twig. Illustrations of workers.

Wheeler 10-128: same illustrations.

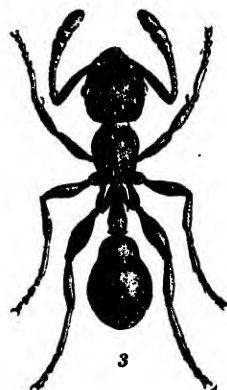
Wolcott 23-57: on coffee.

Wolcott 24-29: eaten by *Anolis cristatellus*.

in mountains north of Yauco on coffee (425-21), on *Inga vera* (611-22), nesting in old stump (608-22).



Macromischa isabellae Wheeler.
(Drawn by R. B. Howe.)



Macromischa albispina
Wheeler. (Drawn
by R. B. Howe.)

Macromischa albispina Wheeler 08-139, TYPE from Culebra Island, one colony in the ground in the shade of a thicket. Illustrations of workers.

Wheeler 10-128: same illustrations.

(as var. *pallipes*) Mann 20- : from P. R.

Tetramorium guineense Fabr.

Wheeler: on Culebra Id., eating papaya, *Carica papaya*, fruit.
Van Z. (P. R. 1016).

in tunnel of *Diatraea saccharalis* Fabr. in sugar cane at
Yabucoa (65-13 det. Wheeler); in house at San Juan (I No.
974 det. Wm. M. Mann).

Tetramorium (Tetrogus) simillimum F. Smith

Wheeler: under stones and logs on the beach of Culebra Id.,
and in the creek bottom at Coamo Springs.

Wolcott 24-16: eaten by *Anolis pulchellus*.

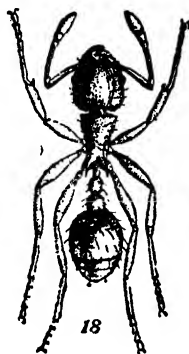
entering small holes in the buds of sugar cane (152-20
det. Mann); adult (I No. 5587).

Wasmannia auropunctata Roger

Wheeler: "common—under stones, prostrate plantain trunks
or logs in shady places," on Culebra Id., and at many points
in Porto Rico. Illustration of worker.

Van Dine 13-30: attending *Pseudococcus sacchari* Ckll. on sugar
cane.

Van Dine 13-33; Jones 15b-15: attending *Sipha flava* Forbes
on sugar cane. Colón 19-30: mention. Van Z. (P. R. 321).



Wasmannia auropunc-
tata Roger. (Drawn
by R. B. Howe.)

Wetmore 16-75, 87, 101, 108: eaten by Swift, Swallow, Oven-
Bird and Parula Warbler.

Van Zwaluwenburg 17a-515: reported to occasionally kill out
and displace colonies of "hormiguilla" in coffee groves.

Wolcott 24-14, 16 to 19, 22, 25, 29, 33: eaten by *Anolis ever-*
manni, *pulchellus*, *krugii*, *stratulus*, *cristatus* and *gundlachi*.

Wolcott 24-3, 10: five individuals in 3 sq. ft. of pasture at
Pt. Cangrejos; in coffee groves.

EEP-50: erroneously thought to be the cause of leaf-miner injury to coffee.

Wolcott 33-223: "albayalde."

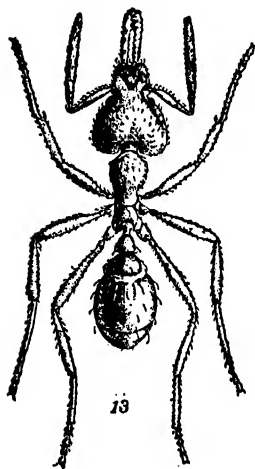
attending *Pseudococcus sacchari* Ckll. on sugar cane (181-11, 205-11, 596-12); attending *Pseudococcus citri* Risso on coffee at Ciales (600-21) attending *Sipha flava* Forbes on sugar cane (331-12); on coffee at Yabucoa (606-22), at Quebradillas (616-22); attending cottony cushion scale at Bayamón 138-22; most often noted, since the introduction of green scale, *Coccus viridis* Green, attending this scale in coffee groves (GNW & FS).

Strumigenys rogeri Emery

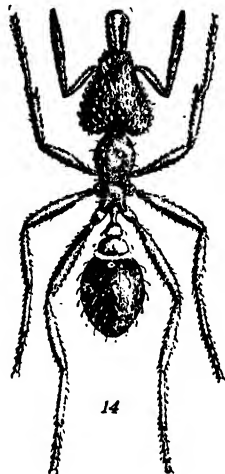
Wheeler: under stones in stream bed at Coamo Springs. Illustration of worker.

Wetmore 16-119: eaten by Mozambique.

(as sp.) Wolcott 24-29: eaten by *Anolis cristatellus*.



Strumigenys rogeri Emery.
(Drawn by R. B. Howe.)



Strumigenys obscuriventris
Wheeler. (Drawn by
R. B. Howe.)

Strumigenys louisianae Roger, var. *obscuriventris* Wheeler 08-145, TYPE from Coamo Springs, Porto Rico, colonies in dry stream bed. Illustration of worker.

Wheeler 10-132: same illustration.

Atta (Trachymyrmex) jamaicensis Ern. Andre

Wheeler: from Culebra Id.

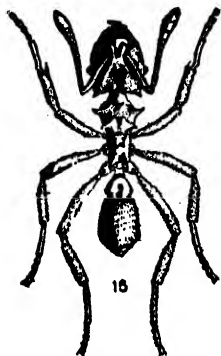
Wheeler, Wm. M., "The Fungus-growing Ants of North America", Bull. Amer. Mus. Nat. Hist., Vol. 23, Art. 31 pp. 669-807, pl. xlix-liv, fig. 31, New York, September 30, 1907.

Atta (Mycocepurus) smithi Forel, var. *borinquensis* Wheeler 07-718, TYPE Vega Baja, Arecibo, Utuado and Monte Mandios, from Porto Rico.

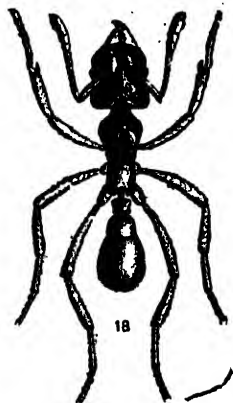
Wheeler: from many points in Porto Rico.

Wheeler 10-320: Illustration.

Wolcott 24-16, 22: eaten by *Anolis pulchellus* and *A. stratulus*.



Atta smithi Forel. (Drawn by R. B. Howe.)



Myrmicocrypta brittoni Wheeler. (Drawn by R. B. Howe.)

Myrmicocrypta brittoni Wheeler 07-728: TYPE from Santurce, P. R. Wheeler: at Santurce. Wheeler 10-318: Illustration.

Cyphomyrmex rimosus Spinola **minutus** Mayr

Wheeler 07-719: Wheeler 10-319: Illustration.

Wheeler: from Culebra Id., and many points in Porto Rico.

Wetmore 16-101: eaten by Oven-Bird.

Wolcott 24-16: eaten by *Anolis pulchellus*.

(615-22), nesting under cow dung (269-12); under rotten log of *Erythrina glauca* at Cayey (617-22); at Aguas Buenas (I No. 1198).

DOLICHODERINAE

Tapinoma melanocephalum Fabr.

Wheeler: "nesting under stones and under the bark of trees" at many places in Porto Rico, and on Culebra Id.

Wolcott 24-14, 16, 29: eaten by *Anolis evermanni*, *A. pulchellus* and *A. cristatellus*.

Wolcott 24-4: 74 individuals in 3 sq. ft. of pasture at Pt. Canegrejos.

Wolcott 33-223: "albaricoque."

attacking live insects (110-21), carrying off dead insects (456-12); nesting under board on ground (163-13); in office at San Juan, (I No. 972).

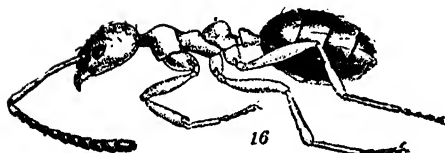
Tapinoma littorale Wheeler

Wheeler: "in hollow twigs of trees and bushes" at Monte Morales and Monte Mandios.

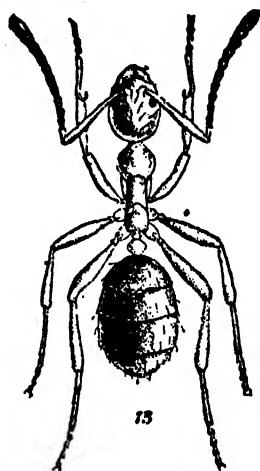
Wolcott 24-16: eaten by *Anolis pulchellus* and *A. cristatellus*. at Aguas Buenas (I No. 1198 Leonard 32-143).

Dorymyrmex pyramicus Roger ,var. **niger** Pergande

Wheeler: "common in sandy and sunny places" in Porto Rico, but not on Culebra Id.



Iridomyrmex melleus Wheeler. (Drawn by R. B. Howe.)



Iridomyrmex melleus Wheeler. (Drawn by R. B. Howe.)

Iridomyrmex melleus Wheeler 08-151, TYPE from mountains of Porto Rico. Common in mountains, arboreal, nesting in hollow twigs, or building "carton" nests at base of leaves of "ortegón", *Coccoloba rugosa*, at Utuado, which are not aphid sheds. Illustrations of workers and "carton" nests.

Wheeler 10-223: construction of "carton" nests.

Wolcott 23-57: on coffee.

Wolcott 24-16, 25: eaten by *Anolis pulchellus* and *A. stratulus*. on coffee trees, nesting in hollow twigs, or in bark in crotch, or between crossing limbs, and often building "carton" nests over colonies. at Guayama (605-21), at Corozal (606-21), at Adjuntas (607-21, 608-21), and in cocoon of *Megalopyge krugi* Dewitz (610-21), at Aibonito (611-21).

Iridomyrmex melleus var. **fuscescens** Wheeler 08-153, TYPE of variety from Monte Morales and Monte Mandios, Porto Rico, at the summits of the mountains.

on cotton at Boquerón (601-23 det. J. D. More).

Iridomyrmex humilis Mayr—det. S. A. Rohwer

on pineapples at Manatí (I No. 682). The only record of the Argentine Ant from Puerto Rico.

CAMPONITIDÆ

Brachymyrmex heeri Forel

Wheeler: "small colonies under stones" at Santurce and Utuado, and on Culebra Id..

Van Z. (P. R. 153).

Wolcott 26-16, 29: eaten by *Anolis pulchellus* and *A. cristatellus*.

Brachymyrmex heeri var. **obscurior** Forel

Wheeler: at Santurce.

Van Dine 13a-32; Jones 15b-15: attending *Sipha flava* Forbes on sugar cane. Colón 19-30: same data.

Van Z. (P. R. 317).

attending *Sipha flava* Forbes on sugar cane (332-12).

Prenolepis longicornis Latreille

Wheeler: "very common in houses, gardens and fields" in Porto Rico and on Vieques Id.

Wolcott 24-16, 25, 29: eaten by *Anolis pulchellus*, *A. stratulus* and *A. cristatellus*.

Wolcott 24-3: four individuals in 3 sq. ft. of pasture at Pt. Cangrejos.

(I No. 975); in house (134-11); on *Inga vera* at Yauco (610-22), carrying tobacco seed from seed beds at Caguas (25-10); nesting, at base of coconut palm fronds on the beach at Mameyes, attending mealybugs and *Orthezia insignis* Douglas on *Lantana camara* (335-22).

Prenolepis vividula Nylander

Wheeler: from Culebra Id., Utuado and mountains of Porto Rico.

Hoffman 32-726: attending Cottony Cushion Scale.

on coffee at Utuado (155-20), on *Inga vera* at Utuado (156-20); on banana, nesting in stem, at Maricao (157-20 det. Wm. M. Mann).

Prenolepis steinheili Forel

Wheeler: at Adjuntas and Santurce.

Prenolepis fulva Mayr

Van Z. (P. R. 1021).

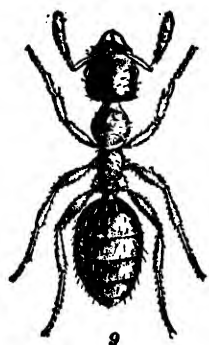
attending *Pseudococcus sacchari* Ckll. on sugar cane at Humacao (57-10 det. Wheeler).

Myrmelachista ambigua Forel, subsp. **ramulorum** Wheeler 08-155, TYPE from Arecibo and Utuado, Porto Rico, and Culebra Id., in hollow twigs of sea-grape, *Coccoloba uvifera*, and "torchuelo", *Bucida buceras*. Illustrations of worker.

McClelland, T. B., "Report of the Assistant Horticulturist" in Ann. Rept. P. R. Agr. Expt. Station at Mayagüez, 1911, p. 30. Washington, D. C., Sept. 3, 1912: in three months driven from coffee when old infested shade trees, *Inga laurina*, are cut down.

Hooker 13-34; on guamá and coffee trees. feeding on honey dew from a mealybug, *Pseudococcus citri* Risso, and a large fleshy, pink scale of the sub-family Coccinae. Injury and unsuccessful control measures.

Van Zwaluwenburg 15-33: unsuccessful methods of control.



Myrmelachista ramulorum Wheeler. (Drawn by R. B. Howe.)



Myrmelachista ramulorum Wheeler. (Drawn by R. B. Howe.)

McClelland, T. B., "Report of the Assistant Horticulturist" in Ann. Rpt. P. R. Agri Expt. Station at Mayagüez, 1913, p. 23. Washington, D. C., May 28, 1914: control by pruning young growth of coffee shade trees, *Inga laurina*, and banding with tree tanglefoot.

Van Zwaluwenburg 16-42: desirable coffee shade trees, not attractive to the "hormiguilla" not found.

Van Zwaluwenburg 17-515: the most complete and extended account of the "hormiguilla" as a pest of coffee.

Van Z. (601) attending undetermined pink *Coccus* in twigs of *Inga laurina*.

Wetmore 16-63; eaten by Woodpecker.

Wolcott 21-48: notes.

Ferris, G. F., "Notes on Coccidae. IX. (Hemiptera)" in Canadian Entomologist, Vol. 54, No. 7, July, 1922, p. 160: description of the coccid, attended by the "hormiguilla," as *Cryptostigma ingae*.

Wolcott 23-58: host trees: attending *Cryptostigma ingae* Ferris and preliminary experiments in control with poisoned bait.

Wolcott 24-54: experiments with sodium arsenate and meat, potassium cyanide, cyanamid, and potassium ferro-cyanide.

Wolcott 24-93 to 95: details of control experiments with cyanide and meat.

Wolcott 24-8 to 10: partial control using cyanide and meat shelves.

Wolcott 24-14, 19, 25, 29, 33: eaten by *Anolis evermanni*, *A. pulchelus*, constituted 12% of the food of *Anolis stratulus*, eaten by *Anolis stratulus*, *A. cristatulus* and *A. gundlachi*.

EPP-46 to 48: an economic account.

Wolcott 26-51: in sea-grape, also in St. Thomas.

Leonard 32-128: notes.

Wolcott 33-266: considerably reduced in numbers by the hurricane of San Felipe.

EEWI-316 to 321: an extended economic account.

Wolcott 33-232 to 238: an extended account of control experiments with meat and cyanide and meat and thallium.

Wolcott 34-95: summary of the above.

nesting in sea-grape, *Coccolobis uvifera*, attending a mealy-bug at Loíza (607-22), at Dorado (126-32); nesting in twin tree of *Ficus laevigata* in Ciales valley south of Manatí (621-22); on coffee, guava, *Inga vera*, and guamá, *Inga laurina*, throughout the coffee districts, at Utuado (153-20), at Lares (154-20), at Yauco (396-21), at Cayey (618-22); also in orange and "tulipán" or African tulip tree at Consumo and Maricao (19-35); on *Inga laurina* and coffee at Maricao Forest Reserve, elevation 2,700 ft. (20-35); successfully preventing "hormiga brava" from ascending mango tree and feeding on hamburger steak and salt pork poisoned with thallium nitrate (40-34); defeated in a imilar contest on guamá tree at Mayagüez (F. S. & GNW).

Camponotus ustus Forel

Wheeler: "in the hollow twigs of sea-grape, *Coccoloba uvifera*," at San Juan and Utuado, in Culebra Id., nesting in the ground under a block of beach-worn coral."

Wetmore 16-63: eaten by Woodpecker.

Wolcott 24-29: eaten by *Anolis cristatellus*.

in old stump at Utuado (159-20), at San Sebastián (115-21); in dead twigs of *Inga vera* at Utuado (158-20), at Ciales (600-23; in coffee at Lares (640-21); in rotting post at Naguabo (48-25); on *Tetrazygia elaeagnoides* at San José (602-23); in house (22-35).

Camponotus sexguttatus Fabr.

Wheeler: on Culebra Id., in twigs of sea-grape, illustration. At San Juan, and Fajardo (A. Busek), on flowers of *Serjania lucida* at Coamo.

Camponotus cuneiscapus Emery

Van Z. (P. R. 620).

SPHECOIDEA

CRABRONIDÆ

Crabro croesus Lepeletier

Dewitz. Gundlach, "Los ejemplares de Puerto Rico diferentes en algo del tipo cubano — en el color de la pubescencia."

Van Z. (P. R. 64).

at Guayama (I No. 4660); on Mona Id. (1308-13); reared from cocoons in rotten log (78-23 det. S. A. Rohwer).

Crabro mayeri Dewitz 81-201: TYPE from P. R.

Gundlach, "en los contornos de Mayagüez."

Psen (Mimesa) modesta Rohwer 15-244: TYPE from Mayagüez, P. R.

Cerceris krugii Dewitz 81-201: TYPE from P. R.

Gundlach, "en varias localidades."

(as sp.) Wetmore 16-98: eaten by Jamaican Vireo.

Cerceris margaretella Rohwer 15-248: TYPE from Mayagüez, P. R.

Trachypus gerstaeckeri Dewitz 81-202: TYPE from P. R.

Gundlach, "en Mayagüez."

NYSSONIDÆ

Nysson (Bathystegus) basirufus Rohwer 15-247: TYPE from Mayagüez, P. R.

Hoplisus (Hoplisoides) scitulus Cresson—det. S. A. Rohwer

(891-13); on mulberry at Arecibo (I No. 4867 "I").

BEMBECIDÆ

Bembex ciliata Fabr.

Dewitz. Stahl. Gundlach, "vive en las playas." Ashmead. at Santa Isabel (419-13 det. S. A. Rohwer).

Bembex muscicapa Handlirsch—det. G. A. Sandhouse
on flowers at Salinas (I No. 4651).

Bembex regularis Cresson
Stahl.

Stictia signata Linn.

(as *Bembex*) Ledru 1797. Dewitz. Stahl.

(as *Monedula*) Gundlach, "común en terrenos arenosos, cavando allí hoyos con mucha prontitud. Apenas se le ve posarse, pues vuela prontamente como jugueteando un individuo con otro."

Danforth 26-23: chasing flies over the Cartagena Lagoon, living in holes in the ground around its margin.



Stictia signata L. Three times natural size.
(Drawn by F. Maximilien.)

AMC: at Mayagüez xi-29, Yauco vi-31, Juncos i-32.

at Ponce (I No. 4650), at Algarrobo (751-14), at Trujillo Alto (888-13), at Dorado around icaco blossoms (715-13), on sandy ground at Vega Alta (169-15); chasing *Chrysops variegatus* De Geer, on horses at Pt. Salinas (GNW), chasing flies attracted to molasses (182-21 det. Rohwer); on *Crotalaria* flowers at Arecibo (I No. 3635).

Microbembex monodonta Say—det. S. A. Rohwer

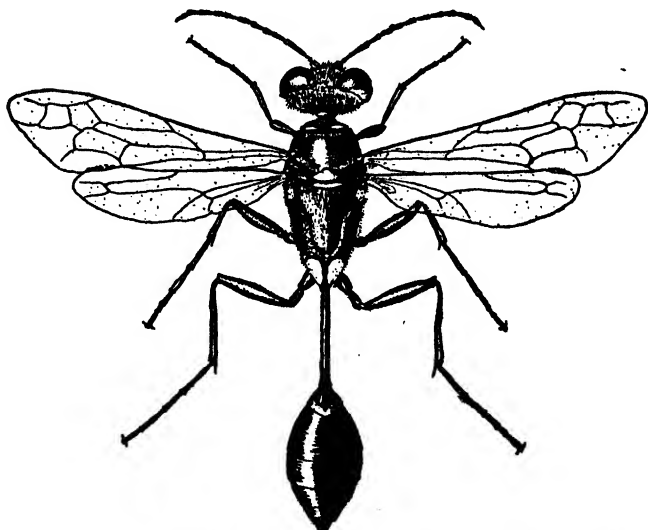
AMC: many localities.

resting on sand (I No. 3843, 3844); in pepper field at Loíza Aldea (I No. 4109).

SPHECIDÆ (LARRIDÆ)

Sceliphron caementarium Drury—det. S. A. Rohwer

(I No. 2974 Leonard 33-136); on *Crotalaria* flowers at Manatí (I No. 4414, 5559); building nests of mud, provisioned with spiders (81-24).



Sceliphron assimile Dahlbom (from Haiti). Three times natural size. (Drawn by F. Maximilian.)

Notogonidea fuliginosa Dahlberg
(as *Larrada*) Stahl. Gundlach.

Notogonidea ignipennis Smith
(as *Larrada*) Dewitz. Gundlach, "en Quebradillas."
Van Z. (P. R. 71).

(I No. 880), at Ponce (108-13 det. S. A. Rohwer, I No. 4639), on cane at Guánica (GNW); on *Crotalaria* flowers at Barceloneta (I No. 5342), at Vega Baja (I No. 3594).

Notogonidea luteipennis Cresson
(as *Larrada*) Dewitz. Stahl. Gundlach.

Notogonidea trifasciata Smith
(as *Larrada*) Dewitz. Stahl. Gundlach. Ashmead.
at Manatí (I No. 662); on grapefruit flowers at Naguabo
(I No. 5373).

Notogonidea vinulenta Cresson
(as *Larrada*) Gundlach.
Van Z. (det. Rohwer).
on Mona Id. (1310-13 det. Rohwer); on grapefruit flowers
at Barceloneta (I No. 2331 Leonard 33-136, I No. 3668).

Larra americana Saussure—det. GNW, confirmed G. A. Sandhouse—introduced, the Changá Parasite.

Twenty-five adults from Belem, Pará, Brazil released at Pt. Las Marias on Feb. 17, 1936 1-36), others to be released at Bejucos. Isabela, from later consignments.

Tachytes argentipes Smith—det. S. A. Rohwer

(650-12, 684-12, 125-17, 138-17), on corn leaves at Aguadilla (25-22); on Mona Id. (1309-13 det. Rohwer), on *Crotalaria* at Arecibo (I No. 3655), at Barceloneta (I No. 3679); on mango flowers at Mayagüez (I No. 5169).

Tachytes insularis Cresson

Dewitz. Gundlach, "rara."

Prionox thomae Fabr.

Dewitz. Stahl. Gundlach. (as *Chlorion*) Van Z. (P. R. 1011).

(as sp.) Wetmore 16-77: eaten by Kingbird.

(as *Spheg*) AMNH.

(768-12) on dry hill at Ponce (107-13, I No. 4638), at Isabela, carrying off small grasshopper, larger than herself (210-21); at Salinas (I No. 4646—det. as *Chlorion*).

Ammobia dubitata Cresson—det. S. A. Rohwer

(as *Chlorion*) Van Z. (P. R. 93).

AMC: many localities.

(803-14); with *Conocephalus fasciatus* DeG. in her burrow (675-12).

Ammobia ichneumonea Linn. var. *auriflua* Perty

(as *Spheg croesus* Fabr. and as *S. auriflua* Perty) Stahl.

(as *Spheg*) Dewitz. Gundlach, giving also determination by Saussure as *Spheg croesus*.

(as *Spheg* and as *Sceliphron*) Ashmead. AMC: many localities. on flowers at Pt. Cangrejos (606-17); at Aibonito (I No. 4645).

Chlorion (Ammobia) singularis Smith—det. G. A. Sandhouse

at Guánica (I No. 1656 Leonard 33-131), at Salinas (I No. 4648).

VESPOIDEA

BETHYLIDÆ

Goniozus sp.—det. C. F. W. Muesebeck

at Guayama (I No. 3401).

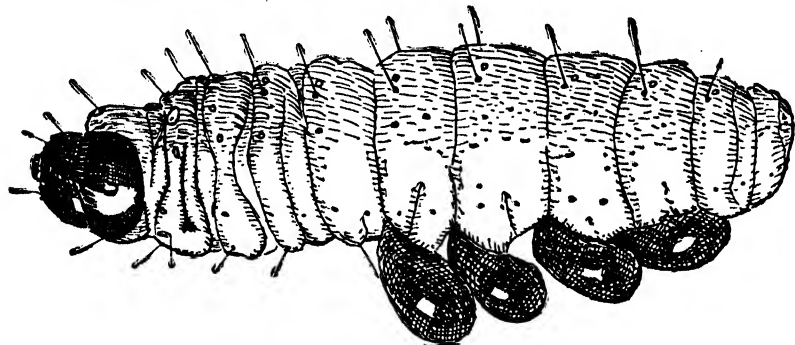
Perisierola nigrifemur Ashmead—det. C. F. W. Muesebeck

reared from larvae of *Pyroderces rileyi* at Isabela (69-33).

Perisierola prob. cellularis Say—det. A. B. Gahan

Wolcott 33-251: illustration of larvae parasitizing larva of *Fundella cistipennis*.

reared from larva of *Fundella cistipennis* at Isabela, collected January 7th, drawing made on 8th, larvae fully grown on 9th, cocoons on 10th, adults on 20th.



Larvae of *Perisierola prob. cellularis* Say, feeding on caterpillar of *Fundella cistipennis* Dyar. Fifteen times natural size. (Drawn by G. N. Wolcott.)

DRYINIDÆ

Gonatopus sp. nov.—det. C. F. W. Muesebeck

(146-12, 180-12, 210-12, 214-12, 658-12) reared by Thos.

H. Jones from cocoons on cane leaves.

† gen. nov, sp. nov., **Lestrodryinini**—det. C. F. W. Muesebeck

reared from cocoons accompanying heavy infestation of *Ormenis infuscata* Stahl on grapefruit at Manatí (71-33).

SCOLIIDÆ

Box, Harold E.,

“Porto Rican Cane-Grubs and Their Natural Enemies.” Jour. Dept. Agr. P. R., Vol. 9, No. 4, pp. 291-356, fig. 21, ref. 15. San Juan, October 1925.

Jepson, W. F.,

“Conference sur le *Phytalus smithi* faite a la Chambre d’Agriculture.” Rev. Agr. Ile Maurice, No. 75, pp. 79-84. Port-Louis 1934: an account of a search for Scoliid wasps in Puerto Rico.

Tucker, R. W. E.,

Report of the Entomological Section, Dept. Sci. Agr. Barbados. Agr. Jour. Barbados, Vol. 3, No. 2, pp. 16-19. Bridgetown, April 1934.

Wolcott, G. N.,

“The Present Status of White Grub Parasites in Puerto Rico.” Jour. Agr. Univ. P. R., Vol. 18, No. 3, pp. 436-441, fig. 2, ref. 6. San Juan, October 27, 1934.

Elis haemorrhoidalis Fabr. = **Elis (Myzine) sexcincta** Fabr.

(as *Myzine sexcincta* Fabr., with *Myzine nitida* Cr. and *Tiphia haemorrhoidalis* Fabr. in synonymy with different specimens) Stahl.

(as *Myzine sexcincta* Fabr.) Dewitz. Gundlach. Aldrich.

(as *Elis sexcincta* Fabr.) Van Dine 13-29; Van Dine 13-254 and Smyth 17-55: mention.

Wetmore 16-82: eaten by Flycatcher.

Van Z., as parasitic on *Lachnosterna* spp.

Wolcott 22d-14: parasite of grubs of *Phytalus insularis* Smyth.

Wolcott 24-29: females eaten by *Anolis cristatellus*.

Box 25-334 to 335: a summarized account, giving all known information, illustration of both sexes.

"During February and March, 1200 females were collected, and released in another hacienda where *Phytalus* grubs were known to be common in certain fields, but where hitherto no signs of the presence of the parasite had been noted, with the result that on the 3d of April they had accounted for 7% of the *Phytalus* grubs, while three weeks later parasitism had amounted to 26%. During late May and early in June, the parasites were more abundant in their new quarter than in the locality from which they had been taken."

Wolcott 25-53: host grubs weigh three to six times as much as adult wasps.

EEWI-127: "possibly the most abundant Scoliid wasp to be found in Porto Rico. The female is black, marked with yellow, the yellow bands of the abdomen being interrupted so that a continuous black stripe extends down the center of her back. The males are very slender, marked and banded with yellow, and sometimes cluster in large compact masses on low vegetation, such clusters containing not a single female."

Wolcott 34-103: Jepson's search for in Puerto Rico.

Tucker 34-17: did not attack *Phytalus smithi* in Barbados.

AMC: many localities.

males common on sandy land, in clusters of hundreds, resting on weeds, or flying about close to the soil. at Bayamón (I No. 5300), at Trujillo Alto (885-13), at Algarrobo (766-14), at Dorado (I No. 4187), at Garrochales (I No. 5377), at Guánica (663-14). at Guayama (I No. 4637), at Isabela (146-31), at Pt. Cangrejos (GNW) and on Vieques Id. (GNW); females in cane field at Barceloneta (17-22); in grapefruit grove (281-16); feeding on excrement of *Aphis gossypii* Glover on cotton at Isabela (281-21); feeding on excrement from green scale on grapefruit at Isabela (GNW); at flowers of sea-grape, *Coccolobis uvifera*, on beach west of Arecibo (166-23).

Both sexes reared from cocoons collected in plowed field at Plantaje, Pt. Salinas, in outer threads of which were entangled the mandibles of *Phytalus apicalis* Blanchard (= *P. insularis*

Smyth) third instar grubs (64-22). From some cocoons a hyperparasite, *Anthrax gorgon* Fabr. (64A-22) emerged. A single cocoon found in near-by field being plowed September 1933 (W. F. Jepson & GNW).

***Elis ephippium* Fabr.**

(as *Myzine*) Gundlach, "rara". Ashmead.

(as *Tiphia*) Dewitz.

(as *Myzine apicalis* Cresson — described from a male) Stahl. Gundlach, "común-----acaso sea la misma que *M. ephippium* Fabr".

(as *Elis xanthonotus* Rohwer 15-234: TYPE (113-12) from P. R.) Rohwer. S. A., Proc. U. S. Nat. Mus., Vol. 57, No. 2312, 1920, p. 228: synonymy of *E. xanthonotus*, described from a female, with *Elis ephippium* Fabr.

(as *Elis xanthonotus* Roh.) Smyth 17-55: mention.

(as sp.) Wetmore 16-77: eaten by Kingbird.

Box 25-335 to 337: a summarized account.

Wolcott 34-437: W. F. Jepson found in abundance at Cidra, reared from *Lachnosterna portoricensis* or *L. vandinei*.

Tucker 34-17: synonymy with *E. xanthonotus*, observed in Puerto Rico with Jepson, attempted introduction into Barbados, where three generations were reared on grubs of *Phytalus smithi*.

AMC: at seventeen localities.

females (113-12). on flowers (1212-13). in greenhouse (365-19), a female on flowers of *Cordia corymbosa* at Mayagüez (254-23); a female on flowers of *Tribulus cistoides* at Puerta de Tierra (22-34); a female on grapefruit at Dorado (I No. 4935); a male on grapefruit at Dorado (I No. 4931); adults at Garrochales (I No. 5385).

one male (unlabeled) agrees with Cresson's description of *Myzine apicalis* except that the femora are piceous on basal half, extending to apex beneath, otherwise yellow, and all tibiae are yellow. "The female wasps occur on the flowers of *Hyptis atrorubens*, the males on those of *Mitracarpus portoricensis*. The male wasps differ greatly from the female, being slender with yellow stripes, and the characteristic up-turned genital organ." E. G. Smyth.

***Myzine nitida* Smith**

Stahl. Box 25-337: (as *Elis*), mention.

***Tiphia argentipes* Cresson**

Dewitz. Stahl. Gundlach, abundant. Ashmead.

(as sp.) Wetmore 16-77: eaten by Kingbird.

Box 25-338 & EEWI-112: mention.

***Tiphia* sp. (possibly the above)**

Wolcott 22d-12: Wolcott 23-55: notes.

Box 25-338 & EEWI-112: extended discussions.

three males collected by Mr. E. H. Barrow, feeding on secretions of a scale, *Pulvinaria psidii* Mask., on *Rauwolfia nitida* at Guánica, (243-21)—"closely allied to *floridana* Robertson and *illinoensis* Robertson"—det. S. A. Rohwer, another male, same data (318-21), another male on cotton at Yauco (39-22).

Campsomeris atrata Fabr.

(as *Scolia*) Dewitz. Stahl. Gundlach, "muy común; su vuelo es lento y con ruido visita las flores".

Ashmead. Wolcott 22d-14: mention.

Box 25-339: *Strataegus* grubs as hosts, life history and illustration of adults.

AMC: Utuado viii-30, Mayagüez ii-29, ix-30.

from flowers in cane field at Aguirre (370-13); a female at Lares (13-23), at Ponce (I No. 4642), at Adjuntas (I No. 2654).

Campsomeris dorsata Fabr.

(as *Tiphia*) Dewitz. (as *Scolia*) Stahl Gundlach, "rara".

Van Z. (P. R. 43).

"While I was getting these grubs (of *Ligyrrus tumulosus* Burm.), I found 28 cocoons of a wasp, very probably the black one with two reddish bands across the abdomen, because while digging, two flew out. This wasp is commonly seen in the callejones and cane fields. I also found one grub with a medium sized larva attached to it, and one with the egg of the wasp freshly laid on its body" letter of H. Bourne (June 20, 1913) from Hacienda Santa Rita, Guánica, P. R. Reared to adult (491-13).

Van Dine 13-254: Colón 19-51; Smyth 17-55: mention.

Wetmore 16-77. 80, 91: eaten by Kingbird, Petchary and Mockingbird.

Smyth 19-141: Wolcott 21-44; Wolcott 22d-14: parasitic on grubs of *Ligyrrus tumulosus* Burm.

(as *Diebis*) Box 25-342 to 343: all known data, with illustration of adults.

EEP-15: parasitic on white grubs.

Wolcott 25-53: host grubs weigh 6 or 7 times as much as do the wasps.

Dexter 32-3: 70 specimens (all males) eaten by 8 toads.

EEWI-126: note.

Wolcott 34-103: W. F. Jepson sent to P. R. in search of.

Jepson 34-80: "I have released 11 fertile female *Campsomeris dorsata* which traveled for 53 days and then several lived over 40 days after arrival" in Mauritius.

Wolcott 44-438: quoting Box and Jepson as to great abundance on South Coast, but at date finding five times as abundant at Puerta de Tierra, due to scarcity of toads, which eat adults of host grubs.

AMC: many localities.

common on south (dry) side of the island on sandy land, feeding on the nectar of flowers or resting on cane leaves, at Guánica or Yauco, (46-11, 48-11, 232-11, 380-12, 99-13, 100-13, 106-13, 504-13, 136-21, 241-22), at Ponce (68-15, I No. 4662). at Aguirre (372-13). at Arroyo (101-16).

on the north side (580-12), at Maunabo (666-17), at Trujillo Alto (889-13), at Arecibo (18-15), at Jayuya (I No. 4656); resting on asparagus stem at Palo Seco (I No. 449—det. Gahan); resting on casuarina at Barceloneta (I No. 3262—det. Sandhouse, 3667); on *Crotalaria* flowers at Arecibo (I No. 3634), at Dorado (I No. 4197); males clustered on casuarina trees at Puerta de Tierra in June (39-33—Jepson & GNW); about 60 per morning on flowers of caltrop, *Tribulus cistoides*, more rarely on *Bidens pilosa*, very rarely on *Kallstroemia maxima* at Puerta de Tierra (19-34), not more than 15 per morning on flowers, mostly *Bidens pilosa*, at Santa Rita (Guánica) Tablon 1, 9 to 11 A. M.; about the same number of males, 10:30 A. M. to noon.

***Scolia plumipes* Drury**

Dewitz. Gundlach, "rara".

***Campsomeris trifasciata* Fabr.**

(as *Tiphia*) Dewitz. (as *Scolia*) Stahl. Gundlach, "común". Van Z. (P. R. 42). Smyth 17-55; Wolcott 22d-14; mention. (as sp.) Wetmore 16-77, 80: eaten by Kingbird and Petchary. Tucker 34-17: failed to survive in Barbados.

Wolcott 34-437: found abundant at Cidra by W. F. Jepson.

(I No. 2705, 2873, 749-12, 740-12, 926-13), at San Juan (990-13), at Maunabo (667-17); on grapefruit at Bayamón (I No. 65); on *Crotalaria* at Pueblo Viejo (I No. 2829); on rose (I No. 1159).

***Campsomeris maculata* Drury = *C. druryi* Ckll.—synonymy by**

S. A. Rohwer

Ashmead.

***Campsomeris tricineta* Fabr.**

Ashmead. (as *Scolia*) Stahl. Gundlach.

(as *Campsomeris pyrura* Rohwer 15-235: TYPE from Mayagüez, P. R.) Smyth 17-55; Wolcott 22d-14: mention.

Wolcott 34-438: found not uncommon at Cidra by W. F. Jepson. AMC: at Luquillo viii-31, Mayagüez xii-32.

Tucker 24-17: synonymy of *C. pyrura* Rohwer, failed to survive in Barbados on grubs of *Phytalus smithi*.

at Ponce (I No. 4653), at Adjuntas (I No. 4655), in squash field (I No. 3772), on flowers of *Stachytarpheta jamaicensis* near Comerío (771-13).

***Campsomeris hyalina* Lepeltier (introduced)—det. S. A. Rohwer at Aguirre (I No. 460) —imported from Venezuela.**

PSAMMOCHARIDÆ (POMPILIDÆ)

Pepsis caerulea Linn.

(as *P. speciosa* Fabr., synonymy by Gundlach) Dewitz. Ashmed. Gundlach.

Pepsis marginata Palisot de Beauvois

Stahl.

Petrunkévitch, Alex., "Tarantula versus Tarantula-Hawk a Study in Instinct." Jour. Exp. Zool. Vol. 45, No. 2, pp. 367-393, pl. 2. 1926: attacking *Cyrtophilus portoricae* Chambers under cage conditions.

AMC: at Luquillo vi-32, vii-32, Río Piedras 1-32, Mayagüez ix-2.

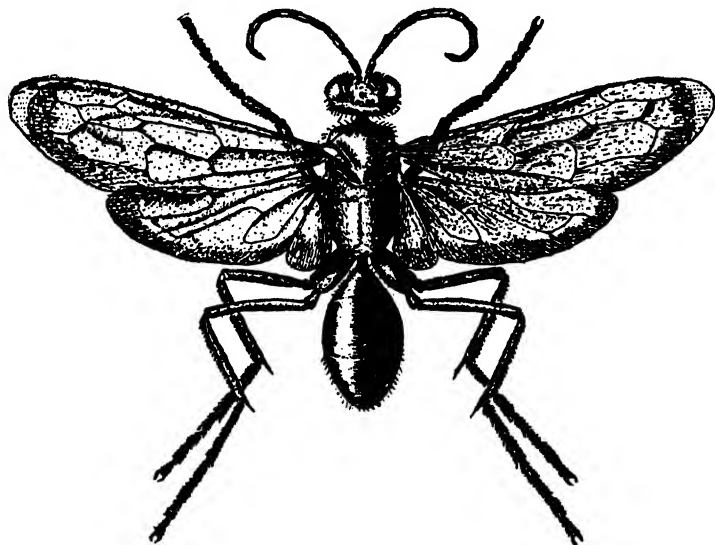
adults on flowers (306-12, 584-16, 517-18).

Pepsis heros Dahlbom

Dewitz. Gundlach. Ashmead.

(as sp.) Wetmore 16-77: eaten by Kingbird.

adults near the beach at Santa Isabel (369-13), at Pt. Cangrejos (396-22).



Pepsis rubra Drury. Twice natural size. (Drawn by F. Maximilien.)

Pepsis rubra Drury—det. S. A. Rohwer

Danforth 31-80: eaten by Grey Kingbird.

AMC: at Yabucoa viii-30, Luquillo vii-32, vi-31, Río Piedras i-32.

(626-12), at Pt. Cangrejos, feeding on flowers of *Mitracarpus portoricensis* (395-22), at Aguirre (69-16), at Santa Isabel (369-13).

Pepsis ruficornis Fabr.

Dewitz. Stahl. Gundlach. Ashmead.

AMC: at ten localities.

at Jayuya (I No. 2819), at Vega Baja (I No. 5050).

Psammochares cubensis Cresson

(as *Pompilus anceps* Cresson) Stahl. Gundlach.

(as *Pompilus*) Ashmead.

AMC: at six localities, (as *Notiochares*—det. N. Banks).

Psammochares (Pompilus) coruscus Smith

Gundlach, "algo rara." Dewitz.

Psammochares (Pompilus) cressoni Dewitz 81-203: TYPE from P. R.

Gundlach, "rara."

Psammochares ferrugineus Dahlbom

(as *Pompilus*) Dewitz, "rara." Ashmead.

Psammochares fulgidus Cresson

(as *Pompilus*) Dewitz. Gundlach, "cogida en Quebradillas."

(as *Anophilus*—det. N. Banks.) AMC: at Mayagüez ix-28.

Psammochares flavus Cresson

(as *Pompilus*) Gundlach.

Episyron sp.—det. G. A. Sandhouse

at Loíza Aldea (I No. 5142).

Pompiloides propinquus Fox—det. S. A. Rohwer

(648-12), at Guayama (668-17), at Bayamón (I No. 5534).

Batazonus flavopictus Smith

(as *Pompilus*) Gundlach, "rara."

Batazonus hookeri Rohwer 15-237: TYPE from Mayagüez, P. R.

at Ponce (109-13).

Batazonus mundiformis Rohwer—det. G. A. Sandhouse

on *Commelina* (I No. 5584).

Batazonus mundus Cresson

(as *Pompilus concinnus* Cresson) Dewitz.

(as *Pompilus*) Gundlach. Ashmead.

Cryptocheilus flammipennis Smith

(as *Pompilus ignipennis* Cresson) Dewitz. Ashmead.

(as *Pompilus*) Gundlach, with, *P. ignipennis* in synonymy.

"rara".

(as *Cryptocheilus ignipennis* Cresson det N. Banks) AMC: at Río Piedras i-32, Utuado viii 30, xii-30, at Luquillo vii-32, at Florida xii-30.

at Cayey (26-21).

Pseudagenia bella Cresson

(as *Pompilus*) Dewitz. Gundlach, "en Mayagüez." Ashmead.
Van Z. (det. Rohwer).

reared from mud nests in leaves of *Inga vera* at Cayey (366-22 det. S. A. Rohwer).

VESPIDAE

Polistes canadensis L.

Wetmore 16-77: eaten by Kingbird.

Polistes crinitus Felton—det. S. A. Rohwer

(as *Polistes americanus* Fabr.) Dewitz. Stahl. Gundlach.
Ashmead.

Van. Z. (P. R. 57).

Jones & Wolcott 22-41: predaceous on pupa of *Prenes nero* Fabr.

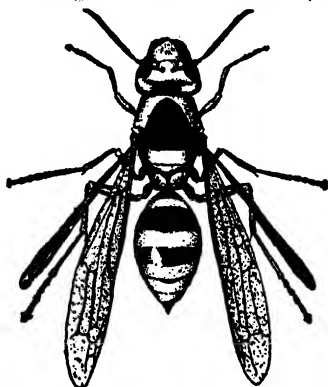
(as sp.) Wetmore 16-77, 80, 82, 84: eaten by Kingbird, Pet-chary, Flycatcher and Wood Pewee.

Wolcott 24-29: eaten by *Anolis cristatellus*.

Danforth 26-112: eaten by Jamaican Cliff Swallow.

AMC: many records.

(I No. 2874 Leonard 33-136), at Ponce (109-13), at Añasco (41-10), at Cayey (325-17), at Adjuntas (I No. 3996), at Aibonito (SSC), at Guánica (455-13); (as Var. *americanus* F.—det. Sandhouse) on grapefruit flowers at Barceloneta (I No. 2332 Leonard 33-136), at Vega Baja (I No. 5044), at Jayuya (I No. 2821); more abundant than honeybees on flowers of *Commicarpus scandens* L., the sticky-seeded vine, at Guánica in May 1934, constituting 70 to 80% of all large Hymenoptera coming to these flowers (GNW).



Polistes major P. B. Twice natural size.
(Drawn by F. Maximilien.)

Polistes major P. B.—det. G. A. Sandhouse

at Adjuntas (L. 4652), on icaco flowers (I No. 2872); on mango blossoms at Mayagüez (I No. 3688); on *Crotalaria* flowers at Barceloneta (I No. 3837).

Mischocyttarus cubensis Saussure

(as *Polybia*). Stahl. Ashmead.

(as *Megacanthopus*) IP-41.

(as *Megacanthopus* sp.) Danforth 26-97: eaten by Grey Kingbird.

in coffee groves in the mountains, at Ciales (77-21, det. S. A. Rohwer as *Megacanthopus*, 460-21, 218-22); in grapefruit grove at Vega Alta (516-16, 115-17); on El Duque at Naguabo (729-14); on orange leaf at Bayamón (I No. 512).

Mischocyttarus phthisicus F.—det. G. A. Sandhouse

(as *Polybia*) Dewitz. Gundlach. Ashmead.

at Adjuntas (I No. 3997); in orange grove at Barceloneta (I No. 3661).

Megacanthopus indeterminabilis Saussure

(as *Polybia mexicanus* Sauss.) Ashmead.

Van Z. (P. R. 66).

EUMENIDÆ

Zethus rufinodus Latreille

Dewitz. Stahl. Gundlach. "rara en Puerto Rico".

Van Z. (P. R. 46).

on flowers at Lares (99-22 det. S. A. Rohwer); at Adjuntas (I No. 4649) on mango blossoms at Mayagüez (I No. 3822).

Eumenes ornatus Saussure

Dewitz. Stahl. Gundlach. Van Z. (P. R. 205).

EEP-15: provisioning its nests with caterpillars.

AMC: many records.

at Guánica (6-13 as var. *abdominalis* Drury det. S. A. Rohwer), at Pt. Cangrejos (167-15).

Monobiella atrata F.

(as *Odyneurus aethiops* Cresson MS) Stahl.

(as *Rhynchium atratum* F.) Dewitz. Gundlach.

AMC: at thirteen localities.

on weeds (651-12), at Camuy (200-23), at Adjuntas (I No. 2665), at Salinas (I No. 4635), at Guánica (434-13 det. S. A. Rohwer), at Loíza Aldea (I No. 5215); ? parasitic in mud wasp nest at Loíza Aldea (348-21), some of the above determinations as *Pachodyneurus*, but one in 1933 by G. A. Sandhouse is *Monobiella*.

Pachodyneurus nasidens Latreille—det. G. A. Sandhouse

on robe flower at Bayamón (I No. 4423, 5415); at Vega Alta (I No. 4106).

Odyneurus (Pachodyneurus) tibialis Saussure

AMNH.

Odyneurus bucuensis Saussure (MS)

Stahl. Gundlach.

Ancistrocerus dejectus Cresson

(as *Odyneurus*) Dewitz. Stahl. Ashmead. IP-42.

(as *Odyneurus cressoni* Saussure) Gundlach.

(as *O. sp.*) Wetmore 16-80: eaten by Petchary. Danforth 26-97: eaten by Grey Kingbird.

at Loíza (I No. 5214); in large clusters on asparagus frond (224-23 det. S. A. Rohwer).

ANDRENIDÆ

Agapostemon krugii Cresson MS name (Gundlach)

Differs from *A. poeyi* in having base and nerves of wings, and ocelli and legs *black*.

at Jájome Alto (69-15).

Agapostemon poeyi Lucas

Dewitz. Gundlach.

at Vega Alta (156-15).

Agapostemon radiatus portoricensis Cockerell, T. A. P., Proc. U. S.

Nat. Mus., Vol. 55, No. 2264, 1919, p. 209, TYPE of variety from Mayagüez, P. R.

(as *A. festivus* Cresson) Dewitz.

(as *A. tricolor* Lepel.) Gundlach,—a difference from *A. festivus* of Cuba noted by Gundlach and identified as *A. tricolor* Lepeltier by Cresson. Ashmead. Stahl.

Differs from *A. festivus* in having abdomen *brown* above, with basal margin of first four segments of abdomen yellow.

Wolcott 24-3: one individual in 3 sq. ft. of pasture at Pt. Cangrejos.

AMC: many localities.

adults swept from grass at Pt. Cangrejos (GNW); twenty or thirty in a cluster on grapefruit leaves at Manatí (216-16 det. Rohwer); at Dorado (I No. 2714).

Augochlora parva Cresson

Dewitz. Stahl. Gundlach. Ashmead.

(as sp.) Wetmore 16-77: eaten by Kingbird.

Halictus busckii Cockerell—det. G. A. Sandhouse

on flowers of *Bidens pilosa* at Bayamón (I No. 5445).

Halictus poeyi Lepeltier

Ashmead.

Halictus proangularis Ellis—det. G. A. Sandhouse

on *Crotalaria* at Arecibo (I No. 3653, 5036); on milkweed flowers at Bayamón (I No. 5540).

Halictus sp.

Wetmore 16-84: eaten by Wood Pewee.

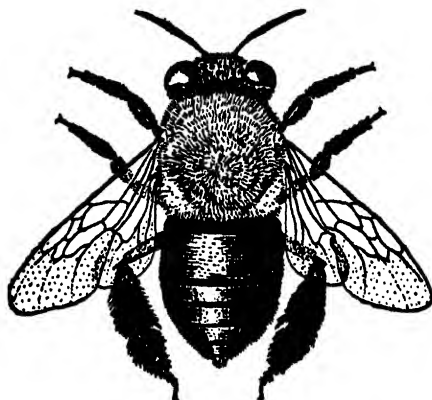
from El Yunque (I No. 5922); on flowers at Arecibo (I No. 5037).

PANURGIDÆ

Panurgus parvus Cresson

Dewitz. Gundlach. Ashmead.

ANTHOPHORIDÆ



Centris testacea Lepeltier (from Haiti).

Three times natural size. (Drawn
by F. Maximilien.)

Centris haemorrhoidalis F.

Dewitz. Gundlach. Van Z. (P. R. 53).

AMC: many localities.

(614-12 det. Rohwer), at Peñuelas (I No. 4644); on lima bean flowers at Barceloneta (I No. 3669).

Centris lanipes Fabr.

Dewitz. (as *C. fulviventris* Cresson and *C. dentipes* Smyth, not in synonymy) Stahl.

Gundlach, "en Mayagüez."

(742-13 det. Rohwer), at Salinas (I No. 4657), at Bayamón (I No. 5293).

(Centris ornatifrons Cresson

Stahl.)

Centris versicolor Fabr.

Dewitz. Stahl. Gundlach, "común." Ashmead.

Wetmore 16-77: eaten by Kingbird.

(as *C. decolorata* Sip.—a misidentification) Van Z. (P. R. 44).
on the beach at Arecibo (272-22), at Dorado (I No. 5671).

Exomalopsis pulchella Cresson

Dewitz. Stahl. Gundlach, "común." Ashmead.

Exomalopsis similis Cresson

Dewitz. Stahl. Gundlach, "común." Ashmead.

Exomalopsis globosa F.—det. J. C. Crawford

AMC: many localities.

(I No. 882) tunneling in hard clay at Guánica (GBM); in flowers of *Barbieria pinnata* at Barceloneta (I No. 3662); in flowers of mango at Mayagüez (I No. 5168); on *Crotalaria* at Arecibo (I No. 654, 2505 Leonard 33-136), at Cayey (I No. 4661).

Anthophora krugii Cresson, E. T., Proc. Acad. Nat. Sci., Philadelphia, 1878, p. 188: TYPE from P. R.

(as *Magilla tricolor* Fabr.) Stahl.

(as *A tricolor* Fabr.) Dewitz. Gundlach, "Mr. Cresson---- la considero distinta de la *A. tricolor*."

Van Z. (P. R. 45). Wetmore 16-77: eaten by Kingbird.

adults on flowers (7-117). at Aguirre (371-13), at Adjuntas (I No. 4658); abundant on tomato flowers (132-17); about 100 resting and flying about in weeds, *Parthenium hysterophorus*, in sunshine at midday (448-12); emerging from burrow in bank at side of road south of Ciales (464-21).

EUCERIDÆ

Melissodes mimica Cresson

Stahl. Gundlach.

Melissodes trifasciata Cresson, E. T., Proc. Acad. Nat. Sci., Philadelphia, 1878, p. 208: TYPE from P. R.

Stahl. Gundlach.

(561-12) at Bayamón (I No. 5294), at Parguera (I No. 3922); on robe flowers at Orocovis (I No. 4659); on *Crotalaria* at Arecibo (I No. 3647), at Barceloneta (I No. 5309).

MEGACHILIDÆ

Hypochrotaenia (Pasites) pilipes Cresson

Dewitz. Gundlach. Ashmead.

at Loíza (I No. 5216), at Ponce (I No. 4647); on flowers of *Barbieria pinnata* at Barcelona (I No. 3662-E), on flowers of mango at Mayagüez (I No. 5168).

Coelioxys abdominalis Guerin

Dewitz. Stahl. Gundlach, "en Mayagüez." Van Z. (P. R. 79).

AMC: at Río Piedras i-32, Mayagüez xi-30, Utuado vii-30.

on *Eleocharis* sp. at Bayamón (I No. 5718).

Coelioxys producta Cresson

Stahl.

Coelioxys spinosa Dewitz 81-197: TYPE from P. R.
Gundlach.

Megachile concinna Smith—det. G. A. Sandhouse
on flowers at Salinas (I No. 4654).

Megachile insularis Cresson
Ashmead.

Megachile lanata F.—det. G. A. Sandhouse
in grapefruit grove at Dorado (I No. 4932), at Trujillo
Alto (I No. 5355); on *Crotalaria* at Barceloneta (I No. 5341).

Megachile martindalei Fox—det. S. A. Rohwer
on bean flowers (688-17).

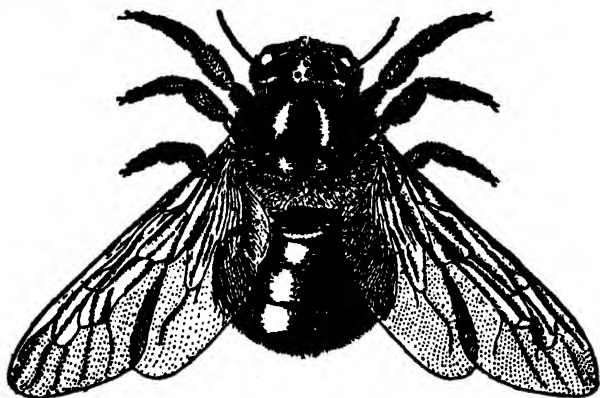
Megachile poeyi Guérin
Dewitz. Stahl. Gundlach. Ashmead.
(as sp.) Wetmore 16-16: eaten by Ani.

Megachile singularis Cresson
Dewitz. Gundlach.

Megachile vitrasi Pérez—det. S. A. Rohwer
the rose-leaf cutting bee, nesting in bamboo (130-22); on
Mona Island (1311-13), at Parguera (I No. 3923).

XYLOCOPIDÆ

Xylocopa brasilianorum Linn.—det. S. A. Rohwer
(as *Xylocopa acnipennis* Linn.) Van Z. (P. R. 48).
(as *Xylocopa morio* Fabr.) Dewitz. Stahl. Gundlach, "Es no-
table por la diferencia de colorido entre el macho y la hembra
(males are yellow, females black). Las larvas viven dentro
de la madera en divisiones separadas en un tubo común, una
encima de otra."



Xylocopa brasilianorum L., female. Twice natural size.
(Drawn by F. Maximilien.)

AMC: many localities.

(73-19). a male on *Lantana* (254-17); adults at Guánica (534½-13), at Aibonito (SSC), tunneling in fence post at Loíza (260-16), at Ponce (I No. 3220), at Guayama (I No. 5211), at Cidra (I No. 2906), at Jayuya (I No. 2657).

MELECITIDÆ

Crocisa pantalon Dewitz 81-198: TYPE from P. R.

Gundlach, "rara".

Nomada krugii Cresson, E. T., Trans. Amer. Ent. Soc., Vol., 7, p. 75, 1878: TYPE from P. R.

(as *N. cubensis* Cresson) Dewitz. Gundlach. Ashmead.

Melissa rufipes Perty

Stahl.

APIDÆ

Apis mellifera L.

(as *Apis mellifica* L.) Dewitz. Stahl. Gundlach, "Esta especie fué introducida de Europa y existe ahora no solamente en los colmenares, sino también cimarrona en árboles huecos de los montes y en las grietas de las peñas".

Busck 00-90: "Very large colonies of a dark variety of *Apis mellifica* were abundant in hollow trees and especially in caves, sometimes also in outhouses. These are annually smoked out and furnish large quantities of honey."

Tower, W. V., "Bee Keeping in Porto Rico". Circ. No. 13, P. R. Agr. Expt. Station, pp. 1-31, fig. 1. Mayagüez, 1913.

Phillips, E. F., "Porto Rican Bee Keeping". Bull. 15, P. R. Agr. Expt. Station, Mayagüez, pp. 1-24, pl. 2. Washington, D. C., May 29, 1914.

Van Zwaluwenburg, R. H., & Vidal, Rafael, "Rearing Queen Bees in Porto Rico". Circ. No. 16, P. R. Agr. Expt. Station, Mayagüez, pp. 1-12, fig. 5. Washington, D. C., Feb. 26. 1918.

Wetmore 16-77: worker eaten by Kingbird.

Vidal, Rafael, "Some of the Needs of the Porto Rican Beekeeper". Gleanings in Beeiculture, Vol. 44, pp. 409-410, fig. 1. Medina O., 1916.

Snyder, P. G., "Beekeeping in Foreign Lands". Gleanings in Beeiculture, Vol. 48, pp. 721-724, fig. 3. Medina, O., 1920.

Seín, F., "Las Abejas en los Cafetales". Circ. No. 79, Est. Expt. Insular, Río Piedras, P. R., pp. 6, fig. 1. San Juan, November 1923.

Wolcott 24-54: Seín's experiments with bees in coffee groves.

Wolcott 24-29: eaten by *Anolis pulchellus*.

Colón, E. D., "Datos sobre la Historia de la Agricultura de Puerto Rico antes de 1898". pp. viii & 302. Cantero, Fernández y Cia., San Juan, 1930: on pp. 155-159 are notes on the introduction of bees into P. R., and on apiculture, based mostly on the writings of Ledrú and of J. R. Abad. In a footnote on p. 158, Lucien M. Iché "La Abeja Doméstica" is quoted that the first bees imported were *Apis mellifica*.

Rodríguez, David A., "Problemas Apícolas de Puerto Rico". Circ. No. 99, Est. Expt. Insular, Río Piedras, P. R., pp. 22, fig. 4. San Juan, 1932.

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HOST PLANT INDEX TO INSECTAE BORINQUENSE

By J. I. OTERO

Most research students of the insects of Puerto Rico have appreciated the great need of a host plant index. This index has been prepared to supply this much needed information. It contains the records of the host plants of insects that have been gathered by many workers in this area. In some cases these workers have given very different names to the same host plants. They have used English, Spanish and scientific names. In some cases they have used different common names for the same host plants. As a result some of these names are confusing or misleading. For example; *Tabebuia pallida* Miers. is a Brazilian plant belonging to the family Bignoniaceae. The local name is "roble", but the Spanish translation of "roble" into English is oak. The oak family does not occur in Puerto Rico.

In order to avoid as many mistakes and as much confusion as possible we have used the scientific names according to Britton and Wilson, Descriptive Botany of Puerto Rico. (Sci. Sur. of Puerto Rico and the Virgin Islands. Vol. V & VI. N. Y. Acad. Sci. 1923-1930.)

The scientific names are given with the paging and all equivalent and synonyms are referred to them. Each scientific name is followed by the common names and synonyms if they are used in the text. The Common names have not been altered in any case but referred to the scientific names. In some cases, workers have used scientific names that we have been unable to locate or trace to synonyms used in Puerto Rico. In these cases we have used the name followed by ("Ex"?) as given by the worker responsible for it.

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ERRATA

- Page 5, line 10, read formerly for formely.
- Page 26, line 3 of text under illustration, read *Blattella* for *Blatella*.
- Page 41, line 31, read *antillensis* for antilleensis.
- Page 42, line 31, read field for fiell.
- Page 68, line 7 from the bottom, read *Dianthus* for Dianthus.
- Page 99, line 4 from bottom, read "pendula" for "pendula.
- Page 101, line 6 from from bottom, read *Acanalonia* for *Aacanalonia*.
- Page 111, line 29, insert the following new record:
Ceropsylla sideroxyli Riley—det. H. J. Dozier
on *Sideroxylon foetidissimum* at Ciales (5-36).
- Page 121, line 7, add the following new records:
on casuarina west of Arecibo (88-35); on grapefruit on Trujillo
Alto road (9-36).
- Page 137, line 28, add the following new record:
on cultivated grape at Guaynabo (3-36 det. H. Morrison).
- Page 141, line 13, add the following new record:
on cultivated grape at Guaynabo (3-36 det. H. Morrison).
- Page 145, line 23, read *diurnum* for *diurnum*.
line 34, add the following new record:
on mistletoe on *Ficus* sp. at Ciales (6-36 det. H. J. Dozier).
line 5 from bottom, after *Bemisia inconspicua* Quaintance, add—
confirmed P. W. Mason.
- Page 146, line 8, read *lignum-vitae* for *lignun-vitae*.
- Page 181, line 11 from bottom, read broods for brods.
- Page 183, line 10 from bottom, read Platypodidae for Platypoidae.
- Page 184, lines 24 & 25, read Leng, C. W. & for Mutchler, A. J.,
Mutchler, A. J., Leng, C. W. &
- Page 188, lines 37 & 38, eliminate **Diaphorus thoracicus**
AMC: at Mayagüez vii-32.
- Page 192, lines 13 & 14 from bottom, read **Ochtheluus** sp. nov. for **Ochtheleus**
sp. nov. ?, and transpose to eight lines above, to be included in
DYTISCIDAE.
- Page 193, line 13 from bottom, read Añasco for Añasdo.
line 17 from bottom, read *tenebroides* for *tenebriodes*.
- Page 196, line 15 from bottom, read Danforth for Ranforth.
- Page 208, line 26, read seed for seeds.
- Page 235, line 11 from bottom, read *Platyedema* for *Phatyedema*.
- Page 249, line 2, read 27th August to 3rd September, 1935, pp. 445-456, fig.
5, ref. 11, for pp., fig. 4.
- Page 250, line 19, read Wolcott 36-452:, for Wolcott 36:.
- Page 271, line 2, read (Coleopt.) for (Coleopt.).
- Page 275, lines 30 & 31, eliminate both lines, see, p. 273, bottom.
- Page 298, line 9, read caltrop for calthrope.
line 9 from bottom, read jillo Alto (I No. 11, 47), etc., for jillo
Alto 11, 47), etc.

Page 303, line 19 from bottom, read *ustulatus* for *usutulatus*.

line 10 from bottom, insert the following records:

on flowers of *Inga laurina* at Adjuntas (I No. 3889), of? at Yauco
(I No. 5768).

Page 304, lines 25, 26 & 27, eliminate all three lines, see record inserted on p. 303.

Page 316 line 24, read "Taladra, for "Talandra.

Page 318, line 15, read *Pseudothysantes* for *Pseudothysanthes*.

Page 327, line 17, read bromeliad for bromelid.

Page 328, line 17, read W. V. Tower, for W. A. Tower.

Page 329, line 17, read Twinn, for Twin.

Page 336, lines 12 to 8 from bottom should read as follows:

***Tabanus lineola* F.**—det. C. T. Greene
at light (I No. 752).

***Tabanus nervosus* Curran** 31-4, fig. of wing: TYPE from Cataño, P. R.

Page 374, line 9, read Coamo for Coado.

Page 375, lines 1 & 5, read *Chaetopsis* for *Checatopsis*.

Page 378, line 9 from bottom, read Sein 35-102 to 112:, for Sein 35-102-112:.

Page 391, line 11, read leaf-miner, for leaf-minor.

Page 393, table: of *Pulex irritans*, the two specimens collected in 1927-28 were
♀s and not ♂s, and one ♀ was collected in 1928-29. Of *Leptopsylla*
musculi, no specimen was collected in 1928-29.

Page 399, line 31, read *Eunica* for *Eunia*.

Page 415, line 13 from bottom, read *Euspseudosoma* for *Euspseudosoma*.

Page 428, line 26 from bottom, read *Xanthoptera* for *Xanthroptera*.

lines 20 & 9 from bottom, read *Helicontia* for *Heliocontia*.

Page 429, line 16 from bottom, read *Tarachidia* for *Tarachira*.

line 3 from bottom, read Schaus for Schaw.

Page 437, line 24 from bottom, read cowpeas for cowpas.

Page 440, line 18 from bottom, read *Sarcophaga* for *Sarphaga*.

Page 453, line 19 from bottom, read spots for opots.

line 9 from bottom, read Stahl for Stanl.

Page 457, line 4, read beets and swiss chard, for beets, Swiss; chard.

Page 461, line 13, read leaves for leares.

Page 462, line 4 from bottom, read cassava for casasva.

Page 465, line 1, read EEWI for LEWI.

line 6, read *Solanum* for *Solenum*.

Page 467, line 3, read Van Z., for Va. Z.

Page 478, transpose lines 8 and 39.

Page 479, line 3, read *Lecanium* sp., on pigeon pea, for *Lecanium* sp., pigeon pea.

Page 483, line 18 from bottom, read TYPE from P. R., for TYPE rfom P. R.

Page 484, line 9, read EEWI-315:, for EEWI:.

Page 508, lines 11 and 10 from bottom, read "Miscellaneous Notes and Descrip-
tions of Chalcidoid, for "Miscellaneous Notes and Descriptions of
Chalcoid.

Page 513, lines 1 & 2, transfer to p. 539, under SCELEONIDAE.

Page 515, line 5 from bottom, read Cresson for Creson.

Page 516, line 21, read Cresson for Cressos.

Page 516, last line, read the, for he.

Page 520, line 9 from bottom, eliminate, the record below should be transferred
to the last line of p. 521.

Page 528, line 19 from bottom, eliminate *Marietta pulchellus* Howard—det. H. L.
Dozier (which is based on an old determination and=*busekii*), and the
record below should be moved up two lines.

Page 529, line 17, eliminate EUCALYMNATUS.
 Page 531, line 20, read *Lepto*—, for *Leopto*—.
 Page 534, line 2, read Indian for India.
 Page 553, line 5, read CAMPONOTIDAE for CAMPONITIDAE.
 Page 555, line 8 from bottom, read similar for imilar.
 Page 559, line 4, read Feb. 17, 1936 (1-36), for Feb. 17, 1936 1-36).
 Page 573, line 7, read MELECTIDAE, for MELECITIDAE.
 Page 581, read Dawnarioides, for Dawnaricoides.
 Page 601, title, read BORINQUENSES, for BORINQUENSE.
 line 8 from bottom, read equivalents, for equivalent.
 line 5 from bottom, read common, for Common.
 Page 602, line 14, read (Regel), for (Rengel).
 Page 603, line 3, read pineapple, for pincaples.
 Page 605, line 9, read *roscopictus*, for *roscopictus*.
 Page 605, line 40, read María, Santa María, for María Santa, María.
 Page 606, line 4, read ceiba, for Ceiba.
 Page 608, line 41, read *Coccoloba*, for *Coeoloba*.
 Page 612, line 19, read flamboyán, for *flamboyán*.
 Page 615, line 23, read (Regel), for (Rengel).
 Page 615, line 35, read *Terminalia*, for *Terminalia*.
 Page 617, line 19, read Barrett, for Barret.
 Page 618, line 16, read morning glory, for *morning glory*.
 Page 621, line 24, read plum, for *plum*.
 Page 622, line 27, read (Mangle, mangrove), for (mangle mangrove).
 Page 623, line 12, read Humboldt's, for Humboldt's.
 Page 623, line 15, read Benth., for *Benth.*
 Page 623, line 18, read *antillanum*, for *antillanum*.
 Page 623, line 37, read *polyphylla*, for *polyphylla*.
 Page 625, line 10, read robe, for robe.
 Page 625, line 15, read *tamarindus*, for *Tamorindus*.
 Page 626, line 25, read broad, for board.
 Page 626, line 32, read *Vitis*, for *Vitis*.

To Dr. W. A. Hoffman, Dr. Stuart T. Danforth and Dr. H. L. Dozier the compiler is indebted for a final inspection of the sections in which they are most interested. Some of the mistakes detected by them, and others, the correction of which could not be made in the already printed pages, are given above as errata.

To Mr. J. I. Otero he is even more indebted for the preparation of the host plant index, the correction and handling of proofs and general supervision of the printing.

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BUTYRIC ACID BY FERMENTATION

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INTRODUCTION

The writer has been interested in industrial fermentation problems since 1929. On various occasions he has expressed his firm belief in the glorious future awaiting fermentation processes in the field of organic industrial chemistry. He has, moreover, expressed his belief that no other territory is better adapted to industrial fermentation work than the tropics; especially in its application to carbohydrate material. The products, by-products, and so-called waste products of the sugar-cane industry offer an abundant and cheap supply of raw material; while the microbiological flora offers in a generous measure the organisms through whose agency the transformation of carbohydrate raw material into useful chemicals will take place.

In the summer of 1931 the writer started a research for the production of butyl alcohol and acetone by a special fermentation carried on blackstraps through the agency of an organism, (*B. Tetryl*), discovered and isolated by him.

In March, 1934, patent application was made before the U. S. Patent Office for this process, and patent rights were granted by the Examiner in April 1935. English patent application is now pending.

A detailed account of the laboratory work connected with this research was published in the October 1934 number of "The Journal of Agriculture of the University of Puerto Rico", which was issued on December of the same year.

In the second part of that publication, mention was made of another investigation started during 1933 along similar lines; this time the work aiming at the production of N. Butyric Acid from blackstrap molasses. The purpose of this paper is to give a full account of the results of this new investigation.

The writer's intention being to apply for patent rights protection for this new process, and eventually enter into its commercial exploitation, he has already presented a petition to the "Board of Trustees of the University of Puerto Rico" to grant him their consent and approval of this action.

BUTYRIC ACID IS A VALUABLE AND IMPORTANT ACID

Butyric acid is one of the most valuable aliphatic acids used commercially; its main drawback to an extended use in the chemical industries being its unnecessary and inexplicable high price. In striking contrast with the declining values that were prevalent in the New York Chemical Market from the latter part of 1929 to the first half of 1934, the price of N. Butyric Acid remained practically constant at 80 cents per pound, based on hundred-percent acid. Recently the introduction of synthetic butyric acid by the Carbon and Carbide Corporation has had a detrimental effect on the price of this commodity; but even so, the price remains too high to encourage a carload use for this chemical. With a view to find a process that would make it possible to sell N. Butyric Acid, with a profit, at a price less than its present cost, this investigation was effected. The success encountered in our previous investigation on the production of butanol and acetone by fermentation, encouraged us to try similar methods in this new study.

DIFFICULTIES ENCOUNTERED BY PREVIOUS INVESTIGATORS

Although processes leading to the production of organic acids by fermentation have been practiced from time immemorial, the mechanism whereby these processes took place, or the agents responsible for them, were utterly ignored. The production of butyric acid remained in the situation common to all these processes until Pasteur recognized the butyric fermentation as a well defined microbiological phenomenon; describing this fermentation as an anaerobic process before the Academy of Science in Paris, 1861.

Since this date, many groups of these organisms have been found and their products of fermentation studied by several well-known investigators; among which we may mention Kirov; Baier; Fitz; Winogradsky; Buchner and Meisenheimer. These men of science agreed that the formation of butyric acid by fermentation when using the organisms known to them, was accompanied by secondary reactions, producers of a variety of other substances. For instance, Buchner and Meisenheimer when working with the "Bacillus

Butyricus" Fitz, found the following products as typical of the fermentation of 100 grams glucose: 0.7 grams butanol; 2.8 grams ethanol; 1.6 grams hydrogen; 3.4 grams formic acid; 10 grams lactic acid; 7.5 grams acetic acid; and 26 grams butyric acid.

Recently, the chemists H. T. Herrick and O. E. May of the Department of Agriculture, Washington, D. C., published a circular on the production of organic acids by fermentation in which they opined that the butyric fermentation had not been applied industrially in commercial magnitude due to the great variety of substances other than butyric acid produced during the fermentation.

The patent literature describes some processes which give the impression that the work has been done in decidedly empirical form. In some cases it is really difficult to understand how a patent could be secured on such vague, indefinite and entirely unscientific data.

ATTACKING THE PROBLEM

Having acquired from the literature a knowledge of the butyric fermentation whose synopsis is given above, it was resolved to attack the problem of butyric-acid production from waste or final sugar-factory molasses using a native bacillus found by the writer. The work was started during July 1933.

PROCEDURE

The laboratory work outlined to carry out this investigation consisted in the first place in the preparation of a suitable medium (using blackstrap as raw material) for the propagation and development of the bacteria, and the production of the desired product of fermentation; and in the second place, the determination of the most favorable conditions of carrying this fermentation, leading to maximum yields with minimum expenditures. This meant the preparation of a "Standard Mash" with such physiochemical modifications as would render it the most suitable menstruum for this particular type of bacillus; and the running of fermentation tests to determine:

(1) *Ability of the Bacillus to Attack both Sucrose and Invert-Sugar for Acid production; or its Hydrolytic Power to convert Sucrose into Invert-Sugar, and then these simple Sugars into Acid.*

This first step was very important since blackstrap consists essentially of a mixture of sucrose and invert-sugar in the approximate ratio of 2:1 respectively. The result of the experiment would determine the necessity of inverting the sucrose content of the mo-

lasses, prior to mashing; a process simple enough in the laboratory scale; but that often brings great difficulties of a chemical, economic, and mechanical nature when the same simple reaction is tried in a manufacturing magnitude.

(2) *Optimum pH Value*.—In industrial fermentation, as well as in all biological processes, the adjustment of the reaction of the nutrient medium is of the utmost importance. A change in the pH value may vary the end products of microbial metabolism in type and in percentage. Besides, there exists limits in which microbial growth is possible, and each and every group of micro-organisms has a definite optimum hydrogen ion concentration for its metabolism.

(3) *Optimum Fermentation Temperature*.—The external temperature is related to the metabolism of the microbial cell; especially so, due to the poikilothermic nature of bacteria. The external temperature is adjusted in relation to the specific fermentation, keeping in mind that the optimum temperature for growth may not necessarily be the optimum for the production of specific end products. It would be well to mention in this connection that the particular strain of butyric ferment used in this work differed in a marked degree in respect to optimum temperature of fermentation from most others that have been mentioned in the literature; the generally accepted optimum being between 35 and 38 deg. C. while in our case we found 30 to 32 deg. C. to be the optimum.

(4) *Optimum Sugar Concentration*.—The importance of this determination is self-evident. The higher the sugar concentration that may be carried during mashing operations compatible with high yields, and ease of fermentation, the better economic results may be obtained when the process is commercially exploited. It means higher unit yields; and economy of equipment, space, power and fuel. In one word: higher net profits.

(5) *Use of Activators*.—It is well known that there are certain substances that help the fermenting organisms in their work, shortening the duration of fermentation or increasing the yield; or acting in both of these directions at the same time. Among these, we may mention various forms of carbon such as charcoal, lamp-black, bone-black, activated vegetable chars, as Darco D-4; diatomaceous earth; various inorganic salts as sodium chloride, manganous sulphate, etc., etc.

In his previous investigation for the production of butanol and acetone, the writer used some of the above-mentioned substances with great success. As will be shown later on, in the present case

these activators had no beneficial effect whatsoever when applied to the butyric acid fermentation.

(6) *Effect of Substituting Glass Fermenters for Others Made of Different Materials.*—This experiment was of great importance from a technical and economic standpoint; since, when transferring the laboratory experimental work to pilot plant operations, glass would hardly be the most adequate material of construction.

(7) *Effect of Surface—Volume Ratio.*—Another important point of consideration; for sometimes a great variation in yield follows from modifications of this ratio.

(8) *Determination of the Advantages of Incorporating Additional Nitrogenous Nutrient to the Mashs Besides Those Found Naturally in the Raw Material.*—Blackstrap contains most of the necessary nutrients for microbial growth; its deficiency in this respect being in most cases in nitrogen. The nitrogen content of blackstrap varies considerably with the country where it is produced and appreciably with different localities in the same country. As extremes, may be taken Cuban and Egyptian molasses; the former running on an average of 1.00 to 1.25 percent nitrogen, while the latter runs as low as 0.3 percent and very seldom above 0.5 percent. Puerto Rican molasses runs on the average of 0.65 per cent nitrogen. It was, therefore, found advisable to determine the effect upon fermentation of the addition of a cheap source of inorganic nitrogen, as sulphate of ammonia. As will be seen later on, the results of this experiment were very interesting.

The experimental data in tabular form (with pertinent comments thereon) in connection with the different topics outlined above, will now follow:

(1) *Determination of the ability of the bacillus to use both sucrose and invert-sugar for acid production; or its hydrolytic power to convert sucrose into invert-sugar and then these simple sugars into acid.*

A set of six mashs was prepared using various mixtures of sucrose and invert-sugar, varying from 100 percent sucrose to 100 percent invert-sugar content. Pure sucrose, laevulose and dextrose were used in the experiment, the mashs being artificially prepared with the addition of blackstrap molasses-ash, and nitrogenous nutrients for the bacteria. The reason to use various mixtures of sucrose and invert-sugar, besides these sugars separately, was due to the belief that while the organism might not be able to attack sucrose in a pure sucrose medium, it might be able to do so when the sucrose was mixed with invert-sugar. The different mashs were autoclaved

for a half hour at 15 lbs. G.P.; cooled down to room-temperature, (about 28° C.) and inoculated with a pure culture of *B. Butyricus*.

At definite intervals during the fermentation samples were withdrawn from individual mashes and analyzed for residual sugars.

The results will be found in the table below:

TABLE No. I

Mash No.	Total Sugar Content at Settling Time		Total Sugar Content after 36 Hours Fermentation		Total Sugar Content after 72 Hours Fermentation		Total Sugar Content on Completion of Fermentation		Completion of Fermentation Hours
	Sucrose %	Invert Sugar %	Sucrose %	Invert Sugar %	Sucrose %	Invert Sugar %	Sucrose %	Invert Sugar %	
1.....	4.50	0.00	3.00	0.50	1.50	0.75	Nil.....	0.45	120
2.....	3.00	1.50	1.55	0.70	0.70	0.60	Nil.....	0.18	96
3.....	2.00	2.50	0.85	1.35	0.32	0.64	Nil.....	0.21	96
4.....	1.00	3.50	0.78	1.40	0.15	0.87	Nil.....	0.23	92
5.....	0.50	4.00	0.29	2.00	0.00	1.02	Nil.....	0.25	92
6.....	0.00	4.50	0.00	2.05	0.00	0.98	Nil.....	0.18	89

The data in Table No. 1 shows in a definite manner that previous inversion of the sucrose content of the molasses became unnecessary, since the *B. Butyricus* showed in this test its ability to attack both sucrose and invert sugars during fermentation. It shows, moreover, that the bacteria would work at its best in a mixture of these sugars, or in invert-sugars alone, as regards the duration of fermentation. In the case where only sucrose was found in the medium, the bacillus took 24 additional hours to complete the fermentation; leaving besides a higher percentage of residual sugars in the fermented mash. The conclusion was arrived at that blackstrap had very good prospects of being a suitable medium since its approximate sucrose invert-sugar ratio agrees quite closely with conditions represented in mash No. 2. From a technical and economic viewpoint it was very fortunate that no inversion of the sucrose in the molasses became necessary prior to mashing.

(2) *Optimum pH Value.*—The importance of this determination has been already discussed elsewhere in this paper.

A series of eleven mashes running from pH 6.0 to pH 7.0 were prepared, using blackstrap of initial pH 5.5. The pH adjustment at mashing was accomplished by the addition of different amounts of calcium carbonate; and these initial values were maintained in individual mashes during the entire period of fermentation through the use of a 100th normal sodium hydroxide solution. The total sugar concentration of all mashes was 4.5 per cent. This value for total sugar concentration was adopted from the results on Table No. 1, as it was evident that the organism could stand this concentration.

The most convenient pH value to use subsequently was to be determined from a consideration of the following items:

- a. Starting time of fermentation.
- b. General apparent activity during fermentation.
- c. Finishing time of fermentation.
- d. Residual sugar content of mashes.
- e. Yield of Total Acidity.

TABLE No. 2

Mash No.	pH value	Fermentation			Residual Sugars %	Total Acidity Grams	Total Acid Yield % Total Sugars
		Time taken to start	Time taken to finish	General activity			
1.....	6.0	18 hrs....	101 hrs....	Fair.....	0.51	1.41	31.4
2.....	6.1	18 hrs....	101 hrs....	Fair.....	0.49	1.43	31.8
3.....	6.2	18 hrs....	100 hrs....	Fair.....	0.43	1.47	32.7
4.....	6.3	18 hrs....	98 hrs....	Fair.....	0.38	1.46	32.5
5.....	6.4	16 hrs....	98 hrs....	Fair.....	0.30	1.48	32.9
6.....	6.5	16 hrs....	96 hrs....	Good.....	0.26	1.55	34.6
7.....	6.6	14 hrs....	96 hrs....	Good.....	0.22	1.56	34.7
8.....	6.7	14 hrs....	96 hrs....	Good.....	0.20	1.57	34.8
9.....	6.8	12 hrs....	90 hrs....	Very Good..	0.18	1.61	35.9
10.....	6.9	10 hrs....	88 hrs....	Very Good..	0.16	1.61	35.9
11.....	7.0	10 hrs....	88 hrs....	Very Good..	0.16	1.63	36.2

From a consideration of the data on Table 2, it appears that the optimum pH value was from pH 6.8 to pH 7.0. Later developments proved that the best practice was to add at once all of the calcium carbonate necessary to neutralize the acid produced during the fermentation. The actual pH values on mashes thus prepared generally ran between pH 7.0 to pH 7.2 as the initial value; these values changing to a range between pH 6.6 and pH 6.9 on completion of the fermentation.

(3) *Determination of Optimum Temperature of Fermentation.*—Although the literature on this subject stated that most butyric acid organisms worked better at from 35° to 38° C., we had carried our two previous fermentation tests at room temperature (about 28° C.) with apparent satisfactory results. This decided us to try a range of from 28° to 40° C. for determining the optimum for this particular strain.

Thirteen sets of six mashes each were prepared, and each set fermented at a different temperature from 28° to 40° C. As it would have taken too much space to report the results of the different individuals in each set, the following table has been prepared giving the average results obtained in each. All conditions of fermentation excepting the temperature factor were maintained constant for all sets.

TABLE No. 3

Mash Set No.	Ferm. Temp. °C.	Duration of Ferm. Hrs.	% Total Sugar* in Mash	% Residual Sugars after Fermentation	Sugars Fermented % Total Sugars	Yield T. Acidity % on Mash	Yield T. Acidity % on T. Sugars	Yield T. Acidity % on Sugars Fermented
1.....	28	108	4.50	0.16	96.44	1.69	37.55	39.05
2.....	29	100	4.50	0.19	95.77	1.66	36.88	38.45
3.....	30	96	4.50	0.15	96.66	1.69	37.55	38.90
4.....	31	96	4.50	0.16	96.44	1.70	37.77	39.15
5.....	32	96	4.50	0.16	96.44	1.71	38.00	39.42
6.....	33	96	4.50	0.19	95.77	1.65	36.66	38.21
7.....	34	96	4.50	0.21	95.33	1.63	36.22	38.00
8.....	35	92	4.50	0.25	94.44	1.61	35.77	37.84
9.....	36	92	4.50	0.40	91.11	1.52	33.77	37.16
10.....	37	92	4.50	0.49	89.11	1.47	32.66	36.70
11.....	38	90	4.50	0.53	88.22	1.45	32.22	36.55
12.....	39	90	4.50	0.65	85.55	1.38	30.66	35.02
13.....	40	88	4.50	0.81	82.00	1.29	28.66	34.89

From a perusal of Table No. 3 it will be apparent that optimum fermentation temperature lies in the range 30°–32° C. This places our strain fully in the mesophilic range.

It is true that at 28° C. the bacillus seems to work almost as well in so far as yield is concerned, but it will be noticed that twelve additional hours are required in this case to carry fermentation to completion, and this is a fact that must be reckoned with when working in commercial scale. A few hours are gained in finishing the fermentation when working at higher temperatures, say, from 38 to 40° C.; but the comparatively low yields of total acidity more than offset this advantage. The great difference in yields is specially apparent in the column of the table under the heading "Total Acidity Yield Percent on Total Sugars"; when a difference of over 9.0 percent is found between results of Mash Set No. 5 and 13.

This ability to work at its best at rather low temperatures is characteristic of this particular strain of *B. Butyricus* as already pointed out, differentiating it from most other known bacteria of this genus.

(4) *Determination of Optimum Sugar Concentration.*—To find out this very important point, the following experiment was carried out:

A set of seven mashes was prepared using ascending values of sugar concentration from 4.59 to 8.52 percent. Optimum conditions previously determined were used in this test, and all factors except that of percentage sugar concentration were kept constant.

The results will be found on Table No. 4.

TABLE No. 4

Mash No.	T. Sugars Content Grams	T. Sugars %	T. Solids %	Ferment. Time Hrs.	Residual Sugars %	T. Acidity Yield Grams	T. Acidity Yield % T Sugars
1.....	18.37	4.59	7.40	95	0.15	8.43	45.00
2.....	21.00	5.25	8.50	95	0.18	9.69	46.15
3.....	23.60	5.90	9.60	96	0.16	10.83	45.91
4.....	26.30	6.58	10.60	96	0.15	12.22	46.50
5.....	28.90	7.22	11.70	98	0.25	12.78	44.22
6.....	31.50	7.88	12.80	102	0.55	12.20	39.01
7.....	34.10	8.52	13.80	108	0.75	13.00	38.12

The above figures show that optimum sugar concentration lies at 6.58 percent. At this concentration the total acidity yield percent on total sugar content of mash is the highest, while the duration of fermentation is fairly good. At sugar concentrations below this, down to 4.59 percent good results are also obtainable as regards percentage yield on sugars; but it will be noticed that the absolute unit yield, i. e. grams acidity per mash distilled, is of course much higher at the optimum of 6.58 percent sugars. On the other hand, when we try to increase the sugar concentration above 6.58 percent, descending yield values are obtained, which are quite noticeable specially when using concentrations of 7.88 percent and 8.52 percent respectively. In these cases, besides, we have an increasing value in residual sugars, and in duration of fermentation. Moreover, the absolute yields are in one case lower than at optimum concentration, and in the other case the slight increase is more than offset by the much higher percentage of sugars used in the preparation of the mash, and the much higher loss in residual sugars. From the above considerations we decided to adopt 6.58 percent as the optimum value for sugar concentration.

(5) *Effect of Activators.*—The beneficial effects to be usually expected from the use of activating agents in industrial fermentation work affect either the yield or the duration of fermentation, or both of these factors. We decided to try only cheap materials, some of which we had successfully used in our previous researches on the aceto-butylic fermentation work. Those selected were: Lamp Black; Bone Black; Wood Charcoal; Darco D-4; and Infusorial Earth.

For this determination six sets of mashes were prepared, using a different activating agent in each of the first five, and the remaining one was used as a check, no activator being added. The activating substances were used in different quantities in individual members of each set, and all optimum conditions previously determined were maintained during these tests.

To avoid using too much space only the average results obtained from each experimental set are recorded in Table No. 5 below:

TABLE No. 5

Mash Set No.	Activator Used	Ferment Time Hours	Residual Sugars %	Total Yield Grams	Total Acidity Yield % Total Sugars
1.....	Wood Charcoal.....	102	0.27	11.78	44.79
2.....	Lamp Black.....	98	0.21	11.87	45.51
3.....	Bone Black.....	100	0.19	12.00	45.62
4.....	Darco D-4.....	96	0.18	12.15	46.19
5.....	Infusorial Earth.....	102	0.23	11.87	45.13
6.....	None.....	96	0.18	12.40	47.14

The results of Table No. 5 hardly need discussion. From a consideration of the figures under the columns headed "Fermentation Time" and "Total Acidity Yield Percent on Total Sugars" it is obvious that neither the duration of fermentation nor the percentage yield were increased by the use of activators. As a matter of fact, the best results were obtained when no activating substances were used.

(6) *Effect of Substituting Glass Fermenters for Others Made of Different Materials.*—For this test, fermenters made out of (1) Sheet Iron; (2) Copper; (3) Enamelled Iron; and (4) Wood, were substituted for the glass fermenters used in all the previous tests.

A set of 6 mashes was made for each kind of fermenter used; all other conditions except the material of construction of the fermenters in the different sets, being kept the same.

On table No. 6 below, will be found the average results obtained in each case.

TABLE No. 6

Mash Set No.	Kind of Fermenters Used	Total Sugars Grams	Ferment. Time Hrs.	Residual Sugars Grams	Sug. Ferm % T. Sugars	Acid Prod. Grams	Acid Prod. % T. Sug.	Acid Prod. % Sug. Ferm.
1.....	Iron.....	26.30	60.00	17.60	33.46	1.93	7.33	22.15
2.....	Copper.....	26.30	*0.00	26.30	0.00	0.00	0.00	0.00
3.....	Enamelled Iron.....	26.30	96.00	0.58	97.79	12.07	45.90	46.92
4.....	Wood.....	26.30	92.00	0.42	98.40	12.15	46.18	46.94

*In the case of the copper fermenters, fermentation never started.

The above results show in a definite manner that metallic fermenters are inhibitive to the bacterial action, copper especially so. In the case of enamelled iron and wood the results are in all respects comparable with those obtained when using glass fermenters.

(7) *Effect of Surface-Volume Ratio.*—This test was of particular importance in a study of this nature, where the ultimate objective of the work is the establishment of this process in commercial magnitude should the final result warrant such action.

Six sets of mashers were prepared as usual; the only variable this time being the amount of individual mash used in each set. The sizes of mash for the different sets were selected as follows: 100 ml.; 250 ml.; 250 ml.; 500 ml.; 1000 ml.; 2000 ml.; and 4000 ml. Care was taken to add the same percentage of inoculant based on total mash volume in all cases; the percentage used being 5.

Average results obtained in each set are recorded in Table No. 7.

TABLE No 7

Mash Set No.	Size of Mash Ml.	Fermentation Time Hours	Residual Sugars %	Total Acidity Yield % Total Sugars	Fermentation Efficiency % Theoretical Yield
1.....	100	120	0.26	45.15	92.33
2.....	250	105	0.22	45.90	93.86
3.....	500	96	0.19	46.40	94.88
4.....	1000	96	0.18	46.90	95.91
5.....	2000	88	0.20	47.10	96.31
6.....	4000	86	0.18	47.50	97.13

The results shown on table No. 7 are quite satisfactory as regards the surface volume ratio effect. As the ratio decreases, i. e. as the volume of mash is increased, it may be noticed that not only the yields of total acidity based on Total Sugars, and the Fermentation Efficiencies increase; but that also the duration of the fermentation is shortened at the same time. The results give us reasonable assurance that in plant operation no fears need be felt as to the possible effect of working in large-capacity fermenters.

(8) *Influence of Incorporating Additional Nitrogenous Nutrient to the Mashers, besides the Natural Nutrients of the Molasses itself.*—In our previous investigation on butanol and acetone production by fermentation, we had noticed a marked rise in yield of solvents from the use of sulphate of ammonia during mashing to the extent of 1 percent on weight of molasses used. Moreover, we also noticed a shortening in the duration of fermentation when this nutrient was added. These facts decided us to try the experiment in the present case, although our present yields were so high that they could hardly stand much improvement without reaching the theoretical limit.

For the experiment, seven sets of mashers were prepared. In six of these sets, ammonium sulphate was added in increasing quantities

from 0.5 gr. to 1.0 gr.; while set No. 7 was run as a check with no addition of this salt.

During the fermentation of the sets containing added sulphate of ammonia, the characteristic odor of hydrogen sulphide could be noticed in the incubator. This was not the case when the check set was fermenting nor had we noticed this phenomenon in our previous work. We concluded that the gas originated from the reducing action of the organism upon the sulphate of ammonia.

The generation of this obnoxious gas during fermentation would have been objectionable enough; but the fact that no beneficial effect could be observed from the use of the sulphate of ammonia, decided us against its further use.

Table No. 8 below presents the data obtained during the above experiment.

TABLE NO. 8

Mash Set No.	Ammonia Sulphate Added, Grams	Fermentation Time Hours	Residual Sugars %	Total Acidity Yield & Total Sugars	Generation of Hydrogen Sulphide
1.....	0.5	100	0.28	46.50	Yes
2.....	0.6	102	0.29	46.50	Yes
3.....	0.7	104	0.29	46.27	Yes
4.....	0.8	106	0.35	45.91	Yes
5.....	0.9	106	0.44	45.62	Yes
6.....	1.0	110	0.21	45.24	Yes
7.....	None.....	95	0.16	47.01	None

THE STANDARD MASH

The knowledge and experience gained through the work effected above, led us to the formulation of the "Standard Mash" for the production of Normal Butyric Acid from blackstrap. We had found that such a mash should possess the following characteristics:

- a. A pH value of 6.8 to 7.0
- b. Density of 10.6 deg. Brix
- c. Total Sugar Concentration of 6.58 percent

and that its fermentation was to be carried at temperatures of from 30–32° C., without the necessity of inverting the sucrose or of incorporating any extraneous bacterial nutrient in addition to that already present in the blackstrap.

After some experiments, it was decided to make the Standard Mash as follows:

To one part molasses by weight, 7 parts water are added. Then to this diluted molasses, 0.135 part calcium carbonate is added. This mixture is autoclaved at 10 lbs. G. P. for 30 minutes, and after cool-

ing to the desired temperature, the mash is ready for inoculation. Determinations of pH in mashes thus prepared, gave values between 6.8 and 7.2; densities between 10.5 and 10.8° Brix and total sugar concentrations between 6.4 and 6.8 percent using average P. R. molasses.

To illustrate, suppose we wish to mash up 100 grams molasses: Add 700 grams water and 13.5 grams calcium carbonate; then sterilize and cool. Simpler mashing operations are not found anywhere in industrial fermentation work.

On Table No. 9 will be found the results of an "Over-All Efficiency Test" run with a series of ten mashes prepared according to directions given above for the "Standard Mash".

The analysis of the blackstrap was:

Degree Brix -----	85.60
Total Sugars (as Invert)-----	52.50
Nitrogen percent -----	0.80
pH value -----	5.5

The analysis of the resulting mash was:

Degree Brix -----	10.80
Total Sugars (as Invert)-----	6.50
Nitrogen percent -----	0.11
pH value -----	7.1

According to the data on Table No. 9, the bacillus butyricus used in this research, when working on "Standard Mash" under optimum conditions of fermentation, possesses the power to:

- a. Finish the fermentation in from 94 to 96 hours.
- b. Use from 96 to 97.5 percent of the sugar content of the mash in this time.
- c. Give a yield equivalent to:
 - (1) 46 to 47 percent on T. Sugars.
 - (2) 47 to 48.5 percent on Sugars Used.
 - (3) 3.00 percent on Mash Weight.
- d. Show a fermentation efficiency (based on theoretically possible yield) of 95 to 96.5 percent on total sugars, and 98 to 98.5 percent on sugars used.

ACID EXTRACTION FROM THE FERMENTED MASH

The method of separating the acid from the fermented mash was as follows:

The first step was to try the reaction of the fermented mash towards litmus paper. If the reaction was acid, then the mash was brought to neutralization by the addition of calcium hydroxide or carbonate.

The neutral, or slightly alkaline mash, was then evaporated down to one-fourth its original volume, preferably under vacuum. At this point the thickened mash was treated with enough sulphuric acid to liberate the fatty acid from its calcium salt, and the mixture was steam-distilled until all of the volatile fatty acid had passed over. In this way a dilute aqueous solution of the acid originally present in the mash was obtained. Usually, the acid was recovered from the water solution in the form of its barium salt.

PRODUCTS OF FERMENTATION

The fermentation produced by the butyric acid bacillus strain discovered and isolated by the writer when operating in blackstrap molasses results in the production of:

1. N. Butyric Acid
2. Hydrogen gas
3. Carbon dioxide gas

the reaction taking place being as follows:



Of these three products the normal butyric acid is, of course, the most valuable; but mention must be made here that the other two

gaseous products may be made to combine through the agency of high temperature and pressure and of some suitable catalyst to produce the purest form of methanol known to industry.

The normal butyric acid is produced in almost theoretical yield, and of a splendid degree of purity—99 percent or better, pure butyric acid. And this fact constitutes the outstanding merit of this process. It is only on very rare occasions that a fermentation product is obtained in such an extraordinary degree of purity.

The writer, after becoming aware of this most extraordinary fact, wished to have his work checked by two independent laboratories. The laboratory of the Bureau of Chemistry at Washington, D. C., and the private laboratory of Dr. Donald F. Othmer, professor of industrial chemistry at the Brooklyn Polytechnic, were selected. Samples of about 200 grams each of the barium salt of the acid were sent to these laboratories. The two reports received were identical, both laboratories reporting the material as *practically pure* butyrate of barium. Dr. Othmer's report further specified that the acid extracted from the barium salt proved to be 99 percent or over, pure butyric acid. That the impurities (if present) could not be determined due to their being present in traces, and the sample of material being so small.

The splendid purity of the acid obtained by this fermentation is of paramount importance should the attempt be made to develop the process in commercial scale. One of the most expensive stages of the plant work, that of purification, would be eliminated from the start. The highest grade of butyric acid now in the market only guarantees from 98 to 99 percent purity; and this is only obtainable in their case, after much and laborious refractionation and purification; while here we have a natural product of practically C. P. quality.

OTHER FERMENTATION TESTS

The work so far described above, strengthened the belief in the writer's mind that his discovery and process could possibly be applied in commercial magnitude. With this idea in mind, new tests were planned and executed that would result in increasing its range of usefulness, or lowering the cost of producing the acid.

Due to lack of space, the new experiments performed will not be given in detail; but the results obtained will be briefly commented.

To test the ability of the organism to work without absolute sterilization of the medium, a series of experiments were performed in which pressure cooking of the mash was eliminated. Instead, the

mashes were prepared by heating to 100° C. at atmospheric pressure during five minutes. The results obtained were in all respects comparable to those produced when working with absolute sterilization under pressure. This encouraged us to go a step further in the same direction, using no heating at all of the mashes before inoculating with the bacillus. Results were again entirely satisfactory comparing favorably with those obtained previously with total and partial sterilization of the medium.

The economic importance of these later tests is self-evident; for, should it be possible to duplicate the experimental results in large scale, normal butyric acid of the highest purity could be produced at extremely low price, not more than a few cents per pound.

Through the courtesy of Mr. Herman Schreiber, consulting chemist of Lansing, Michigan, a sample of final beet molasses was made available to the writer for experimental purposes. The work performed on sugar cane final molasses was duplicated using this beet molasses as raw material; the same satisfactory results being obtained as to ease of fermentation, high yield and purity, of the finished product.

Also, and more recently; through the courtesy of the "Sucesión Serrallés" of Ponce, P. R., the bacillus was put to work on samples of Distillery Slops, for the conversion of the residual sugars contained in this waste material into butyric acid. It is highly significant, both from a purely scientific and industrial viewpoints, that although the Distillery Slops furnished by the "Sucesión Serrallés" contained, on the average, only about one percent of residual sugars; the organism succeeded in transforming them into the acid, almost quantitatively.

USES OF BUTYRIC ACID

(Present and Future)

Due to its present high price (varying between 35 and 80 cents a pound, according to purity of material and quantities bought) Normal Butyric Acid finds most of its use in the Ester Industry. In this field, its application is divided mainly between the Flavor Industry and that of Perfumery and Cosmetics.

In these above mentioned industries we find butyric acid derivatives as Rhodinol; Propyl; Phenyl-Ethyl; Octyl; Linalyl; Iso-butyl; Géranyl; Citronellyl; Cinnamyl; Butyl and Benzyl Butyrates. Also Capryl-Butyric Acid and Butyric Ketone (Butyrone). The prices of these derivatives vary between \$1.35 and \$32 per pound.

Butyric acid derivatives in an impure form are beginning to ap-

pear in the Solvents Industry. "Amyl Ketol" is one of these products, consisting mainly of Butyrone. It is used as a solvent for both cellulose acetate and for nitrate of high nitrogen content; it also dissolves caoutchouc, ester gum, cumarone, linseed and castor oils, glyceryl phthalate and other resins. It is miscible with hydrocarbons. It possesses a rather sweet odor resembling pineapples, and is non-toxic at normal working concentrations.

The future uses of butyric acid in industry, will depend, in a great measure upon the price at which the commodity may be made available. As possible fields of application we may mention the (1) Leather Industry where it would serve as a softener, deliming agent; (2) Lacquer Industry, in the manufacture of plasticisers; (3) Varnish Industry, in the manufacture of Dryers; (4) Cellulose Esters; and (5) Pharmaceutical and Drugs.

The writer has also, of late, been using butyric acid in the preparation of a high grade alpha-cellulose pulp from cane bagasse and foliage. Results to date are entirely satisfactory.

ACKNOWLEDGMENTS

The writer gratefully acknowledges his indebtedness to Dr. D. F. Othmer, professor of chemical engineering at Brooklyn Polytechnic Institute for his painstaking work in checking up the purity of the acid produced, and for the general interest he has taken throughout all the time that this investigation was taking place; to Dr. W. L. Owen, consulting bacteriologist of Baton Rouge, La., for his kind advice and early appreciation of the industrial possibilities of this discovery; to the Bureau of Chemistry of Washington, D. C., for the corroborative analysis on the barium salt of the acid produced; and finally to Mr. Herman Schreiber, consulting chemist of Lansing, Michigan; through whose kindness and interest the work on final beet molasses was made possible.

SUMMARY

1. The ultimate aim of this research was to find an inexpensive biochemical method for the production of Normal Butyric Acid from Blackstrap.

2. A native organism was found and isolated in pure culture which proved admirably adapted to this purpose.

3. Difficulties experienced by previous investigators were obviated in the course of the above described work.

4. The process is simple, inexpensive, and merits further efforts towards its industrial application and commercial exploitation.

5. The main end product of fermentation (Normal Butyric Acid) is obtained in nearly theoretical yield, and of a splendid degree of purity: 99 percent or better.

6. It is the writer's intention to apply for patent rights protection for his discovery and process.

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INVESTIGATIONS ON THE ROOT OF *MANIHOT* *UTILISSIMA* POHL

(PROGRESS REPORT)

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The work appearing now, is the incomplete result of experiments undertaken in cooperation by the Divisions of Agronomy and Industrial Chemistry, of the Agricultural Experiment Station, on the cassava plant. The complete and final results will appear as soon as they are available.

METHODS OF ANALYSIS

1. Determination of Hydrocyanic Acid.

The principal aims of the determination of hydrocyanic acid in the cassava root were two:

First.—To compare the hydrocyanic acid content of the varieties of cassava roots under study.

Second.—To find out if possible the hydrocyanic acid content of the cassava roots at different stages of their growth.

After several methods of analysis were tried finally Liebig's Method was selected and adapted to the cassava, as the easier and more accurate.

One hundred grams of sample are weighed and placed in a two-liter flask; together with 1 of liter distilled water and 20 cc. of H_2SO_4 of known specific gravity are added and the flask is connected to a condenser. The distillate is collected in a 500 cc. volumetric flask, into which have been placed 25 cc. of dilute NaOH solution. At least 500 cc. of the distillate should be collected to ensure that all the HCN in the sample is distilled off. After the distillation is finished an aliquot part is taken and titrated with $\frac{N}{100}$ AgNO_3 . The residue in the flask is saved for the determination of starch and of fiber.

Some trial distillations were made in order to establish the least possible volume of the distillate to be collected for titration. By taking two consecutive portions of distillate of 250 cc. each, and titrating an aliquot of 50 cc. of each separately, it was found that not all the HCN in the sample was collected in the first 250 cc. of dis-

tillate passing over, but that there was yet a perceptible amount in the next 250 cc. portion of distillate obtained as shown by the following results:

Variety of Cassava	1st. Portion	2nd. Portion
Carlos Checo.....	2.9cc.	0.8cc.
Negrona Grande.....	3.2cc.	0.6cc.
Manuel Pichardo.....	2.7cc.	0.4cc.

On using $\frac{N}{10}$ solution of AgNO_3 for the titration it was found that it did not afford the most accurate results obtainable under the circumstances. Comparative results are shown below for titrations made with $\frac{N}{10}$ and $\frac{N}{100}$ solutions of AgNO_3 .

Cassava Variety	$\frac{N}{10} \text{ AgNO}_3$	$\frac{N}{100} \text{ AgNO}_3$
Tapicurú.....	0.40cc.	3.4cc.
M. Pichardo.....	0.20cc.	1.6cc.
Cristalina.....	0.20cc.	1.9cc.
New Orleans.....	0.10cc.	1.0cc.
Carlos Checo.....	0.15cc.	1.5cc.

DETERMINATION OF STARCH AND FIBER

The residue from the distillation of the HCN contains in the solution all the starch present in the sample. It has been transformed into dextrose by boiling with the acid. Besides, this residue contains also the fiber of the sample.

The residue is brought to volume of 1 liter at 20°C and filtered. The specific gravity of the filtrate is determined at 20°C by means of pycnometer. From the specific gravity of the liquid, the starch can be calculated by means of a curve made beforehand, for pure dextrose, and taking into consideration all the factors affecting the results. The fiber is obtained after filtering all the liquid; it is washed carefully and then transferred to a tared crucible, and dried at 100°C .

	Growing Period—4½ Months			Growing Period—12 Months			
	Molsture %	Fibre %	HCN %	Molsture %	Ash %	HCN %	Starch %
Mameya S. A.	62.45	1.6276	0.03375	69.23	0.6327	0.0081	18.01
Ceiba S. A.				61.36	.6239	0.0108	23.99
Brazil No. 1.			0.02430	68.21	.7894	0.0108	
Brazil No. 2.			0.02295	63.04	1.0955	0.0162	21.22
Alpi Manteiga			0.02700	61.62	.8736	0.0108	25.50
Naparica			0.03510	60.16	1.0443	0.0189	24.06
Basiorao			0.02565	58.31	.7839	0.0108	27.19
Tapicuru			0.04320	64.62	.7631	0.0216	
Carlos Checo	64.29	2.0361	0.02497			0.0108	
Negrona Grande	77.20	1.6009	0.02700	66.30	.5553	0.0135	18.54
Manuel Pichardo	67.54	2.3273	0.02092	59.45	1.0369	0.0108	
Negrona Agria	70.13	1.8276	0.03240				
Peralta	68.13	2.4551	0.01417	65.00	.5907	0.0162	20.15
Madretaso	68.46	2.4074	0.03645				
Goyo Vega	61.77	2.0796	0.01755				
Alpi Maugl.	66.04		0.03722				
Señora, está en la Mesa	67.24		0.01687	59.92	.9742	0.0081	24.07
Mata Gato	70.94	2.1762	0.02497				
Pancha	78.92	2.1194	0.02700				
Cartagena 2da.	66.95	1.4205	0.02362				
Dame Más	66.53	2.5220	0.02362				
Mocana 677	65.01	2.1970	0.03307				
Negrona Chiquita	73.41	1.6836	0.01350	60.30	.7637	0.0108	26.92
New Orleans	66.24		0.01552	62.98	.8124	0.0054	
Cristalina	68.49		0.02362	62.48	.9477	0.0108	
Puerto Plata	66.44			63.37	.9507	0.0081	23.00
Valencia	66.10			58.34	.9586	0.0135	27.64
Cartagena Santo Domingo	66.88	2.4058	0.02700				
Miracielo	77.45	1.8706	0.02700				
Amarilla				62.27	.5999	0.01485	20.68
X—No. 1				55.70	.7751	0.0108	28.71
X—No. 2				47.11	.7673	0.0081	29.42
Ceiba Villalba				68.44	.5159	0.0108	18.25
Mata Burro				69.65	.5866	0.0108	16.40
X—No. 6				55.03	.8570	0.0081	28.71
Pana-Borinquen				57.55	.8661	0.0135	25.50
Morada Palo Rojo No. 1.				65.39	.7980	0.0270	22.73
Pana				59.08	.7828	0.0162	27.64
Forastera				65.29	.5162	0.0081	19.43
Blanquilla				57.38	.5531	0.0243	28.71
Pata Paloma				63.85	.5989	0.0162	27.64
Coreana				60.27	.7403	0.0108	26.40
Coreana Amarilla				61.44	.8148	0.0108	26.46
Seda				57.32	1.3876	0.0135	

DESCRIPTION OF THE ROOTS OF CASSAVA VARIETIES

The ideal root of cassava for industrial purposes, either for starch or flour making must possess a number of characteristics all contributing to a cheaper or better final product. The cassava root must have the proper chemical composition—high starch and protein content, low humidity, low fibre content. The rind must be thin; its color must be white. The peel or skin must be thin, smooth, easily detached and of very light color. The inside of the root must be low in coloring matter and when pulped must be easily washed; when dried it must remain white, with no extraneous coloring; it must yield flour or starch of pure-white color.

In no one variety of cassava do we find together all these characteristics. But we believe that by selection and breeding there can

be obtained a type that will be much nearer the ideal than the presently known varieties of cassava.

The ratio of length of root to diameter must be small as a relatively short and thick root is easier to handle in the plant than a long and light root.

We are giving here some of the characteristics of some of the varieties studied, grouped according to color, type and thickness of the skin, underskin, rind and pulp.

I. Varieties with White under-skin.

1. Mameya, S. A.

The skin is thin and rough of dark brown color, underskin white. The rind is medium thick. The pulp is white.

2. Ceiba, San Antonio.

The skin is very thin and rather smooth; and of brown color. Underskin is white. The rind is thin. Pulp is yellowish-white.

3. Brazil No. 1.

The skin is thick and rough of dark brown color. Underskin is white the rind is medium thick. The pulp is white.

4. Brazil No. 2.

The skin is thick and rough and of dark brown color. Underskin is white. The rind is medium thick. The pulp is white.

5. Aipi Manteiga.

The skin is thin and rough of very dark brown color. Underskin white. The rind is thick. The pulp is white.

6. Tapicurú.

The skin is thick and of dark brown color; underskin is white. The rind is thick. The pulp is white.

7. Negrona Agria.

The skin is thick, rough and dark brown. Underskin is white. The rind is very thick. The pulp is white.

8. Cartagena 2da.

Skin is thick, very rough and dark brown. Underskin is white. The rind is thin. The pulp is white.

9. Cartagena Sto. Domingo.

Skin is thin, smooth and of straw color. Underskin white. The rind is thin. Pulp is white.

II. Varieties with light-red Underskin.

10. Manuel Pichardo.

The skin is thin and smooth of light straw color. Underskin light-red color. The rind is thick. Pulp is white.

11. Peralta.

The skin is thin and smooth, light straw color. Underskin light-red color. The rind is thick. Pulp is white.

12. Machetazo.

The skin is thin, medium rough and brown. Underskin is light-red color. The rind is thin. Pulp is yellowish.

13. Señora está en la Mesa.

The skin is thick, rough and dark brown. Underskin is light-red color. The rind is thin. Pulp is white.

14. Dame Más.

The skin is thick, rough and dark brown. Underskin light-red color. The rind is thick. Pulp is white.

15. Mocana 677.

The skin is thick, smooth and dark brown. Underskin is light-red color. The rind is thin. The pulp is white.

16. Negrona Chiquita.

The skin is thick, medium smooth and dark brown. Underskin is light-red color. The rind is thick. The pulp is white.

17. New Orleans.

The skin is very thin, smooth, and of light straw color. Underskin is light-red color. The rind is thin. The pulp is white.

18. Cristalina.

The skin is very thin, very smooth and of light straw color. The underskin is light-red color. The rind is thin. The pulp is white.

19. Puerto Plata.

The skin is thin, smooth and of light straw color. The underskin is light-red color. The rind is of medium thickness. The pulp is white.

III. Varieties having Red Underskin.

20. Miracielo.

The skin is thick, rough and of dark brown color. The underskin is red in color. The rind is thin. The pulp is white.

21. Valencia.

The skin is thick, rough and of very dark brown color; underskin red in color. The rind is thick. The pulp is white.

22. Aipi Mangi.

The skin is thick, rough and of dark brown color. The underskin is red in color. The rind is thin. The pulp is white.

23. Goyo Vega.

The skin is thick, rough and dark brown color. The underskin is red in color. The rind is thick. The pulp is white.

24. Negrona Grande.

The skin is thick, rough and dark brown color. The underskin is red in color. The rind is thick. The pulp is white.

25. Carlos Checo.

The skin is thick, rough and dark brown in color. Underskin is red in color. The rind is thick. The pulp is white.

The results given in this preliminary paper are not final nor complete. Much more work has to be done yet to have the complete chemical and industrial data on the root of the cassava. From the data gathered, however incomplete, certain conclusions can be derived, especially those referring to moisture content and to hydrocyanic acid content. It appears that the water content of the root decreases with its age; obeying the same variation as the hydrocyanic acid content. These variations in general are not of the same degree for different varieties.

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THE RELATION OF BUFFER CAPACITY AND ORGANIC MATTER TO THE SOLUBILITY OF THE NUTRIENT ELEMENTS IN TOA SILT LOAM

By ARNALDO VÉLEZ FRANCESCHI *

ABSTRACT

The reaction of arable soils varies widely. Since each soil is affected and reacts differently from all others to applications of fertilizers and soil amendments, it is the problem of the soil scientist to make recommendations regarding the value of different soil amendments and fertilizers on the basis of individual soil type. It has been the purpose of this work to study the effect of buffer capacity and organic matter on the solubility of the mineral nutrient elements in Toa silt loam. This is an alluvial soil from the northern coast of Puerto Rico. Sugar cane is the universal crop grown on it. This soil type is very fertile. Since the buffer capacity, resistance to change in reaction, or pH, of Toa silt loam has not been extensively studied it was desired to study it more thoroughly.

The six samples of Toa silt loam received the same treatments throughout the experimental procedure. Each sample was treated with successive increments of a saturated solution of calcium hydroxide or tenth normal sulfuric acid, each addition being equivalent to one, two and three tons of calcium carbonate or sulfuric acid equivalents of calcium carbonate per acre, respectively.

It was found that each sample of Toa silt loam behaved differently in the solubility of its mineral nutrient elements. This behavior was largely dependent on the amount of organic matter present in the sample. Some of the nutrient elements like potassium and manganese were found to be more soluble at higher pH values whenever the sample in question was high in organic carbon content. In samples in which the organic carbon content was not as high the solubility of these two nutrient elements was found to increase only at lower pH values. Liming increased the solubility of calcium but did not decrease the solubility of phosphorus although it always decreased the solubility of potassium, manganese, and iron. Additions of acid always increased the solubility of calcium, magnesium, manganese, iron, and potassium. It was found that in samples high in

* Agricultural Extension Agent, Isabela, P. R. Thesis submitted to the faculty of the Louisiana State University and Agricultural and Mechanical College as a partial fulfillment of the requirements for the degree of Master of Science.

organic carbon content the buffer capacity, resistance to change in reaction, was greatest near neutrality. In the samples with a lower per cent of organic carbon the buffer capacity was found to be greatest at the extreme ranges of acidity and alkalinity. This was represented by pH curves plotted against the amount of acid or base used.

This work bears out the fact that the ability of a soil to resist a change in reaction, buffer capacity, is an individual characteristic for each soil. Without a knowledge of the buffer characteristics of the soil, no definite recommendations can be set forth regarding the effect of a particular fertilizer or soil amendment on the soil. This is of great economic importance to the crop grower since additions of fertilizer materials, both acidic and basic, or soil amendments to the soil is a very common practice in the agricultural field. The effect of additions of acidic or basic materials to the soil will not produce the same results in any two soils. The profits to be derived therefrom will be proportional to the power of the soil in question to yield soluble mineral nutrient elements to be used by the plant grown.

INTRODUCTION

The reaction of arable soils varies between pH 4.0 and 9.0 and depends upon the relative amounts of hydrogen, calcium, and sodium adsorbed by the humus and mineral or clay colloids of the soil. Since the humic or clay acids which form weak combinations with adsorbed cations of hydrogen, sodium, or calcium, are unlike normal acids and have no very definitely fixed capacity for combining with bases, they will exhibit the strong buffer capacities characteristic of weak acids or the calcium or sodium salts of weak acids. The strong buffering effect of the soil acids or salts of the soil acids is due to the fact that only a very small fraction of the acid or salt is dissociated at any one time to give hydrogen, calcium or sodium ions, but increasing amounts dissociate and are neutralized when increasing amounts of base or acid are added. The complexity of these colloidal acids or their salts in the soil makes necessary the use of indirect methods for the study of the acidic or basic properties of a soil. These properties are most conveniently and practically measured by curves which show the pH values plotted against the amounts of standard acid or base which has been added to the soil in question.

Different soils contain widely varying amounts and proportions of the humus and clay colloids and the interaction of the humus and clay in different soils varies. There are also changes in the saturation capacities of the soil colloids with changes in the soil re-

action or pH values. Thus the determination of the quantities of bases or acids that must be added to a soil to effect a unit change in reaction is an individual problem for each soil.

Associated with the change in reaction of a soil is the change in the solubilities of the mineral elements in the soil. The changes in the solubilities of the nutrient elements are of especial practical importance. The current practices in the cultivation of crops involve the addition to the soil of both acidic and basic substances as fertilizers or soil amendments. One of the most common basic materials used is lime in some of its forms while the most common acidic materials are ammonium sulfate, sulfur, ammonium chloride, and sulfuric acid.

The study of the effect of the change in reaction of a soil largely resolves itself into a determination of the unit changes in reaction, or pH value, per unit addition of some commonly used basic or acidic substances and the effects of these substances on the solubilities of the nutrient elements. The effects of such additions will be specific for a given soil under a definite set of conditions. Since the buffer capacity, or the resistance to change in reaction, for Toa silt loam has not been extensively studied, it is the purpose of this work to study the effects of additions of calcium hydroxide and sulfuric acid on the changes in reaction of the soil and the solubilities of the mineral nutrient elements in six different samples of Toa silt loam which vary widely in their humus or organic matter content.

REVIEW OF LITERATURE

Comprehensive studies made by Pierre and others (17, 18, 19) show that in most investigations on buffer action of soils the results have been recorded as titration curves representing the amount of acid and base used against the pH obtained. Charlton (17) suggested a method giving fixed numerical values to the buffer capacity of soils by using simple formulae. He states that total buffer capacity toward acid is the amount in milliliters of normal sulfuric acid used to bring 100 grams of soil to pH 4.5. Similarly, he states that the total buffer capacity toward base is the amount in milliliters of normal barium hydroxide used to bring 100 grams of soil to pH 9.5. However, this method is open to question due to the fact that original pH values of soils vary, preventing the indication of the relative power of different soils to buffer given amounts of acid or base. Therefore, Charlton indicated two other expressions which he named "buffer action per 1.0 pH toward acid and toward base". He defined the former

as the total buffer capacity divided by $X-4.5$, where X is the original pH of the soil. The buffer capacity toward base is the total buffer capacity divided by $9.5-X$. He called this "buffer capacity per 1.0 pH" the "specific buffer capacity".

Pierre and Worley (18) found that liming soils in accordance with the amount of exchangeable hydrogen brought the soils to pH 6.5. They also found the average liming factor at pH 6.5 to be 1.43 and at pH 6.0 the average liming factor was 1.52 and so concluded that the exchangeable hydrogen method, unlike the buffer method, gave no indication of the lime needed to bring the soils to pH values other than 6.5.

Runk (23) making a lime requirement survey for Delaware soils found that the lime requirements obtained in the laboratory methods could not be applied in the field without harming the crops. It was found that in some instances lower yields were evident and in others yellow color and stunted leaf growth were observed. However, when smaller applications than those indicated by the laboratory tests were applied to these soils very satisfactory results were obtained. Runk concludes that since the differences in buffer capacities of soils are so varied, "it would seem necessary to know the buffer capacity before applying materials which affect soil reaction".

Slipher (26) found that while applications of lime were arithmetic, the crop responses were geometric. He observed a similar result in the change of soil reaction, pH, by lime. The first addition of lime increases the pH more than does each successive addition applied in multiple additions. The efficiency of lime on a loamy soil was less than on a sandy soil. This he ascribed to the stronger buffer capacity of the loamy soil. Slipher concludes that it appears advisable to use lower rates of liming than have been commonly advised in the past.

Turner (28, 29, 30) shows that the buffer capacity of humus or its capacity for holding cations per unit weight is about six to seven times that of clay and that the exchange capacity of humus is not greatly affected by the presence of clay. When the ratio of clay to organic matter exceeds 20, the organic matter may be present almost entirely as films on the inorganic or clay particles. The saturation deficits of the good soils can be taken as a guide to the amount of hydrolysis which can take place in them, after they attain equilibrium with calcium carbonate. In the same way, their degree of unsaturation is a measure of the proportion of acidoid material unneutralized under these conditions. Turner shows that the quantities of lime requirements based on the extent of unsaturation of the good soils

are equal to the requirements of lime needed to bring the soil into equilibrium with calcium carbonate. The amounts of lime required vary with the degree of unsaturation of the soil. There exists a tendency of the soil reaction to decrease as the soil increases its unsaturation capacity. Magistad, Joffe, and McLean (29) have shown that the solubility of iron and aluminum in soils is dependent on soil reaction as well as upon the nature and amount of the anions present. Iron and aluminum do not always come into solution when acid soils are leached with neutral salt solution; the reasons determining their presence or absence are not fully understood. Turner found no replaceable iron, in some instances a trace was visible, in many soils having low pH values but higher saturation deficits. Iron was not found in the filtrates unless the saturation deficit was as high as 10 to 12 milligram equivalents per 100 grams of soil.

McGeorge (10) found a close relationship between the exchange capacity and the carbon content of soil. From his work it appears that humus overpowers the effect of clay.

Wilbur, Leighty and Shorey (32) observed that the carbon-nitrogen ratio varies considerably in soils. They found that the carbon-nitrogen ratio had a relation to the amount of organic matter present as food for micro-organisms. A ratio of 20:1 was found to indicate a fair amount of decomposable organic matter while a 10:1 ratio, or less, shows an advanced state of degradation of organic matter. They concluded that it was useless to attempt multiplying the total nitrogen by the factor 20 to calculate the organic matter.

Hissink (6) noted that in humus soils the buffer capacity increased near the neutral region. He found also that the buffer capacity (lime required to change pH by 0.1) per unit humus content was independent of the actual humus content of soils examined.

Kuchinskii (7) found that the buffer capacity of soils was almost zero after the clay particles had been separated from the soil. The humus portion of the soil exhibits a high buffer capacity. The greater the buffer capacity the greater the base exchange capacity. This investigator found some relation between hydrolytic acidity and buffer capacity.

McGeorge (11) showed that the exchange capacity of the organic portion increases as the organic matter decomposes. This is due to the fact that the lignin portion of the soil organic matter is most resistant and has the highest exchange capacity.

Morgan (12) observed that soil texture and organic matter content bear a close relationship to the calcium carbonate adsorption

factor. It was noted that clay and organic matter each increased the value of the factor.

Myers and Gilligan (13) concluded that the acidity of a soil, pH, does not indicate the extent of saturation of the colloidal acids and bases and that the pH values of different soil types do not show the relative buffer capacities of the soils in question. They studied the mechanism of buffer action and explain it as follows: "When acid is added to a soil it reacts with the salts of colloidal acids forming colloidal acids and crystalloidal salts. The resultant reaction of the system is only lightly altered in consequence of the weakness of the colloidal acids. When acid is added in excess of that required to react with the cations of the colloidal salts, the crystalloidal salts formed, having an ion in common with the added acid, tend to repress the ionization of the latter. The net result is a small change in the H-ion concentration of the soil dispersion."

Nemec and Gračanin (14) observed that the larger adsorption of potash and phosphoric acid after additions of calcium carbonate was seen only in acid soils (deficient in calcium oxide), but soils containing a fair supply of calcium oxide showed a decrease in the reabsorption of potash and phosphoric acid. These investigators noted that soils containing small amounts of available phosphoric acid respond markedly to calcium carbonate, insofar as the reabsorption of phosphoric acid was concerned, but that in soils with large amounts of available phosphoric acid the calcium carbonate inhibited the reabsorption of the phosphoric acid. The same results were found for potash, but were not as regular.

Pierre, Pohlman, and Melvaine (19) found organic soils to contain low quantities of aluminum even though very acid and that large amounts of organic matter check the harmful effects of soluble aluminum on sensitive crops. These authors showed that there may be less soluble aluminum on acid soils of high percentage base saturation than in soils of low percentage base saturation. The authors showed that the amount of soluble aluminum in different soils of same pH values varied greatly.

Pryanishnikov (20) working with a chernozem soil and three types of podzols adjusted to different reactions (from pH 4.5-8.0) grew plants on them. He found that each soil behaved differently. Mustard plants failed to grow at a pH of 4.5 on a sandy soil but grew at the same reaction on a sandy loam. He concluded that soils with high buffer capacity can support plants even at low pH values. This investigator observed that water extracts from acid soils contained large quantities of calcium, which seemingly arrested the del-

eterious effects of the acids. It was noted that the intake by the plants of this calcium in the acid cultures was obstructed when ammonia was used as a source of nitrogen. He showed that a similar increase of magnesium and potassium in the nutrient solution had an effect much like that of calcium, but not as high. The mobilization of phosphorus and its utilization on limed podzol could be ascribed to the calcium.

This effect of calcium has been noted in the United States, particularly when small applications of limestone have been applied to acid soils with or before superphosphate.

Ganssen (4), observed that humus increases the solubility of phosphates in the soil by decreasing the proportion of active alumina.

The review of literature shows that a study of the buffer capacity of soils resolves itself into an individual problem for each soil. No general recommendation as to the amounts of lime or acidic material which must be applied to a given soil to effect a definite change in the reaction of the soil can be predicted accurately except by tests on the soil. Furthermore, the change in the reaction of the soil caused by the use of an amendment or of a basic or acidic fertilizer is of primary practical importance in its effect on the solubility of the nutrient elements in the soil. The solubility of the nutrients will vary according to the buffer capacity and other associated characteristics of the soil. Since the buffer capacity of Toa silt loam has not been extensively studied, it was desirable to investigate its buffer capacity as related to its organic content and changes in the solubilities of the nutrient elements as affected by additions of lime and sulfuric acid.

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EXPERIMENTAL METHODS

The soil used in this work was six different samples of Toa silt loam. The Toa soils occur very extensively on nearly all the streams of the north coast of Puerto Rico (21). "The Toa soils have developed from material washed from the shale and limestone hills which has been deposited in the stream-flood plains. They are grayish brown to brown in color, silty in texture, nearly uniform in both color and texture to a depth of several feet. All layers are nearly neutral to slightly alkaline."

"Physically and chemically these soils are among the best sugarcane soils in Puerto Rico. They have a nearly level surface relief, good drainage and are almost ideal for maximum agricultural utilization. These soils permit the cultivation of all the land and the use of any kind of modern machinery. The surface soil is loose and porous and is easily cultivated. Water can penetrate it rapidly and there is enough silt and clay in the subsoil to retain large quantities of moisture. These soils have considerable organic matter and plant food, yet fertilizer and lime bring very good returns. This soil will support a wide diversification of profitable crops, but sugarcane seems to be the most profitable as nearly 100 per cent of the land is planted to cane. Yields vary from 30 to 50 tons but field observation indicates that in many places these yields can be doubled with irrigation, proper handling, good fertilizer rates, and, in some cases, liming."

The six samples of Toa silt loam studied were taken at a depth of six inches in the following location:

- I. Central Constancia, 2.5 kilometers north of Toa Baja. Taken at six representative places on March 11, 1931.
- II. Central Canóvanas, 0.5 kilometers east of main office. Taken at six representative places on March 5, 1931.
- III. Finca Nevares, 1.8 kilometers on Toa Baja road. Taken at six representative places on March 11, 1931.
- IV. Finca San Antonio, Bayamón. Taken at six representative places on March 11, 1931.
- V. Kilometers 26.6, Río Grande-Mameyes road (left), side-road El Verde, finca Tamarindo. Taken at three representative places on March 5, 1931.
- VI. Finca El Naranjal, 1 kilometer north of Carolina. Taken at three representative places on March 5, 1931.

All samples were taken by J. A. Bonnet, Chief of the Division of Soils, Insular Experiment Station, Río Piedras, Puerto Rico, and were air dried and passed through a 2 mm. sieve.*

The buffer effect towards lime was determined by the addition of successive increments of a saturated solution of calcium hydroxide to 50-gram portions of soil at rates beginning with the equivalent of one ton calcium carbonate per acre, 0.05 per cent, and increasing to three tons per acre, 0.15 per cent.

After adding the saturated solution of calcium hydroxide, the samples were stirred for five minutes at thirty-minute intervals for half a day. Percival (16) found that by aerating samples after additions of lime had been made, equilibrium was attained during 20 to 24 hours. Since the laboratory equipment did not permit this procedure, intermittent stirring was resorted to and in this way the carbon dioxide was driven off and complete mixing of the soil and lime was obtained. After the addition of the lime increments all the solutions were made up to 73.5 milliliters with water, which was the volume of the largest addition of calcium hydroxide. All samples were evaporated to air-dry condition at room temperature.

Similar procedure was followed in determining the buffer effect towards acid. Tenth normal sulfuric acid was added in increments which were the equivalents of calcium carbonate at the rates of 1, 2, and 3 tons per acre.

The treatments given to each sample of soil were as follows:

1. 50 grams soil plus 30 ml. tenth normal sulfuric acid, equivalent to 2.94 tons sulfuric acid per acre.
2. 50 grams soil plus 20 ml. tenth normal sulfuric acid, equivalent to 1.96 tons sulfuric acid per acre.
3. 50 grams soil plus 10 ml. tenth normal sulfuric acid, equivalent to 0.98 tons sulfuric acid per acre.
4. No treatment. Check.
5. 50 grams soil plus 24.5 ml. limewater, equivalent to 1 ton calcium carbonate per acre.
6. 50 grams soil plus 49 ml. limewater, equivalent to 2 tons calcium carbonate per acre.
7. 50 grams soil plus 73.5 ml. limewater, equivalent to 3 tons calcium carbonate per acre.

The 50-gram portions of air-dried soil were transferred to 500 milliliter Erlenmeyer flasks with 250 milliliters of freshly distilled water. The samples were shaken for 5 minutes and filtered through

* The main purpose in obtaining these samples was to use them in nitrification studies published in Bonnet, J. A. 1935. Nitrification studies with soil types of northern Puerto Rico. *Jour. Agric. Univ. P. R.* 19(2): 73-108.

neutral quantitative filter paper and the following determinations were made on the filtrate:

1. pH.
2. Soluble Ca and Mg.
3. Soluble P.
4. Soluble K.
5. Soluble Fe and Mn.

Total carbon was determined by the dry combustion method of Winters and Smith (34),

Total or protein nitrogen was determined by the Gunning-Hibbard method as modified by Bal (3).

The solubility of phosphorus was estimated by the method of Parker (15).

Potassium was determined gravimetrically by the sodium cobalt-nitrite method as outlined by Van Rysselberge (31).

Calcium and magnesium were estimated by the turbidity methods as given by Schreiner and Failyer (25).

Iron was measured colorimetrically as proposed in Bulletin 31, U. S. Dept. Agr. Bureau of Soils (25).

Manganese was determined by the periodate method of Great-house as described by Yoe (35).

Reaction or pH was determined colorimetrically, using standard indicators and Hellige standard color discs.

EXPERIMENTAL RESULTS AND DISCUSSION

From Table 1 can be seen the changes in the solubilities of the different elements according to the corresponding changes in reaction or pH. Soil I is high in soluble calcium, the check having 384 p.p.m. at a pH of 6.7. In general, Soil I has a high buffer capacity, the lowest pH value attained being 5.0 and the highest being 8.0. The solubility of calcium was doubled from the first two additions of acid. With the third increment, the equivalent of three tons of sulfuric acid per acre, the solubility of calcium increased almost threefold over that in the check. In the alkaline range, the solubility was twice that of the check but the second and third increments, two and three ton equivalents of calcium carbonate, gave the same solubility of calcium. The solubility of magnesium decreased as the pH decreased but increased slightly over that of the check on the alkaline side with the addition of the third increment, the equivalent of three tons of calcium carbonate per acre. Soluble iron was found only as a trace on the acid side. Phosphorus became more soluble

as the acidity increased. On the alkaline side its solubility increased as the pH increased but never attained the magnitude of solubility shown on the acid side. Potash was very soluble at low pH values, becoming less soluble as alkalinity increased.

TABLE 1
RELATION OF CHANGE IN SOLUBILITY OF NUTRIENT ELEMENTS TO CHANGE
IN REACTION IN TOA SILT LOAM, I

Treatment	Ca p. p. m. *	Mg p. p. m.	Mn p. p. m.	Fe p. p. m.	P p. p. m.	K p. p. m.	pH
1.....	1040	160	46	trace.....	3.6	110	5.0
2.....	680	173	18	trace.....	3.3	90	6.1
3.....	671	173	no test.....	trace.....	1.8	43	6.2
4.....	384	203	no test.....	no test.....	2.5	15	6.7
5.....	454	104	no test.....	no test.....	1.2	13	7.2
6.....	769	203	no test.....	no test.....	1.7	18	7.8
7.....	769	346	no test.....	no test.....	2.5	18.1	8.0

* On the basis of dry soil.

In general, the solubility of the nutrient elements in this soil decreased with additions of lime. This soil was the second highest in organic carbon content, 2.25 per cent, (Table 7). It ranked second also in total nitrogen, 0.235 per cent. It can be seen from a comparison of the curves showing the buffer capacities of the several samples and from the organic contents shown in Table 7, that an increase in the soil organic matter increases the buffer capacity near neutrality, which is reflected in a flatter curve.

TABLE 2
RELATION OF CHANGE IN SOLUBILITY OF NUTRIENT ELEMENTS TO CHANGE
IN REACTION IN TOA SILT LOAM, II

Treatment	Ca p. p. m. *	Mg p. p. m.	Mn p. p. m.	Fe p. p. m.	P p. p. m.	K p. p. m.	pH
1.....	453	231	59	trace.....	1.7	40	3.9
2.....	250	181	48	trace.....	2.5	30	4.0
3.....	177	137	25	no test.....	3.1	30	4.6
4.....	40	52	9.3	no test.....	2.8	10	6.0
5.....	67	119	8	no test.....	3.6	20	6.9
6.....	100	133	14	no test.....	3.1	10	7.2
7.....	100	166	trace.....	no test.....	3.1	none.....	7.2

* On the basis of dry soil.

Table 2 shows the behavior of Soil II. The check was low in soluble calcium, 40 p.p.m. As in Soil I, lime increased in solubility as the pH became lower. Additions of lime increased the solubility of calcium over that in the check slightly, but on the acid side the solubility of lime increased tenfold with the addition of the three tons equivalent of sulfuric acid per acre. The changes in the solubility of magnesium were like those of calcium except for smaller

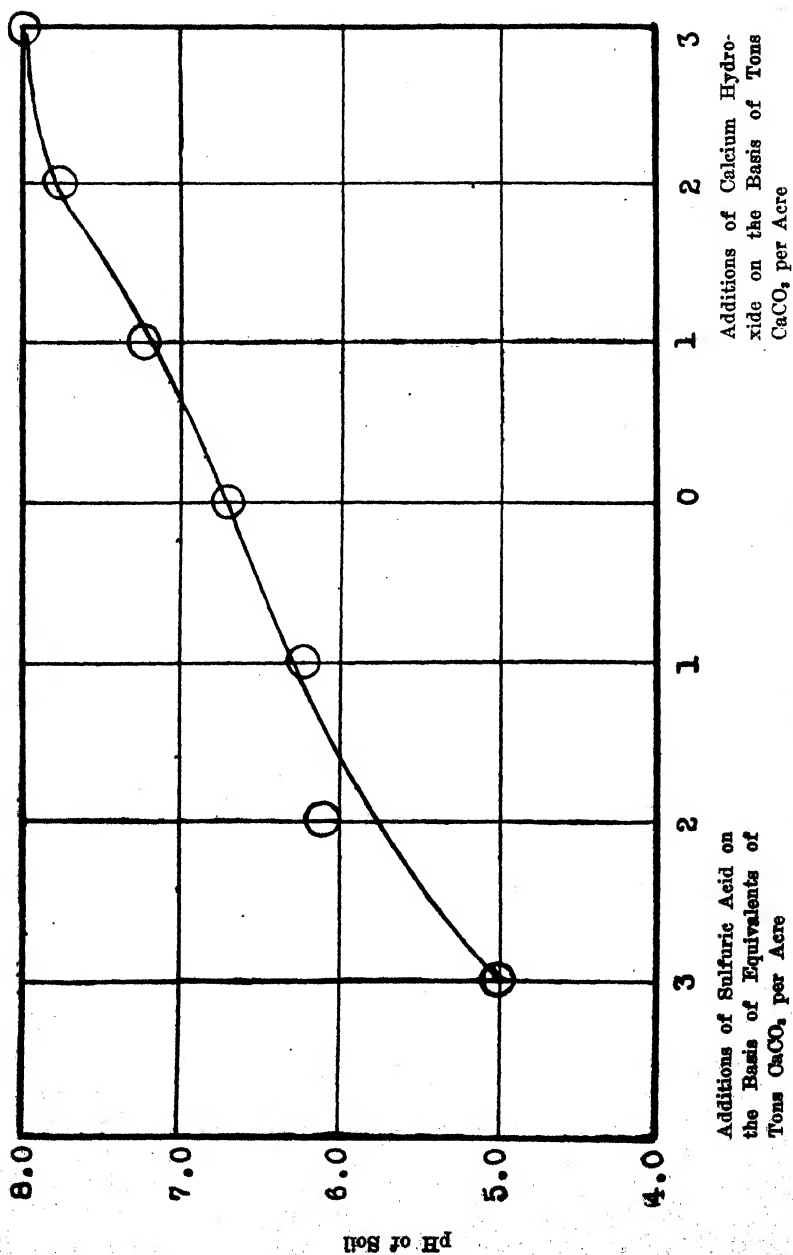


FIG. 1. Buffer Curve for Toa silt loam, I

differences. The soil seemed to maintain about a 1:1 ratio of Ca:Mg at neutrality. Soil II, like Soil I, was high in soluble manganese. This nutrient element was more soluble on the acid range, increasing its solubility as the pH decreased. Manganese was present in the check, (pH 6.0), and in the treatments with the first two increments of lime. There was no appreciable increase in the pH from the addition of the third increment of lime, yet, only a trace of manganese was present as compared to 14 p.p.m. present in the two ton treatment or second increment. There was only a trace of iron at a pH of 3.9 and 4.0. These correspond to the additions of three and two tons of sulfuric acid per acre, respectively. No test for soluble iron was obtained at other pH values in Soil II. The solubility of phosphorus increased with the one ton per acre application of sulfuric acid but in the successive applications the solubility decreased and was less than that of the check. With the addition of one ton of calcium carbonate the solubility of phosphorus was the highest of all, 3.6 p.p.m., this being 0.8 p.p.m. over the check. However, the two and three ton applications of lime decreased the solubility from 3.6 p.p.m. to 3.1 p.p.m. for each application. (It should be mentioned here that the greater solubility of phosphorus on the alkaline range may have been due to the colloidal state of the filtrates since it was impossible to get clear filtrates in the alkaline range.) Potash increased in solubility as the pH decreased. The solubility on the alkaline side was twice that of the check from the one ton treatment of calcium carbonate but decreased thereafter.

Soil II was the lowest in organic carbon content, 1.19 per cent, (Table 7) and it also ranked last in total nitrogen, 0.126 per cent. It is very obvious from the buffer curves of Soils I and II and from Table 7 that Soil I which has a relatively high organic content is highly buffered near neutrality, while Soil II which has a low organic content is lightly buffered near neutrality but is highly buffered at the extreme ranges.

TABLE 3

RELATION OF CHANGE IN SOLUBILITY OF NUTRIENT ELEMENTS TO CHANGE IN REACTION IN TOA SILT LOAM, III

Treatment	Ca p. p. m. *	Mg p. p. m.	Mn p. p. m.	Fe p. p. m.	P p. p. m.	K p. p. m.	pH
1.....	625	92	6.3	no test....	1.4	60	4.0
2.....	525	87	7.8	no test....	1.2	80	4.3
3.....	500	106	trace.....	no test....	1.1	50	4.7
4.....	145	55	no test....	no test....	1.6	10	6.0
5.....	155	81	no test....	no test....	1.4	10	6.5
6.....	190	87	no test....	no test....	1.6	10	6.8
7.....	275	100	no test....	no test....	1.6	30	6.9

* On the basis of dry soil.

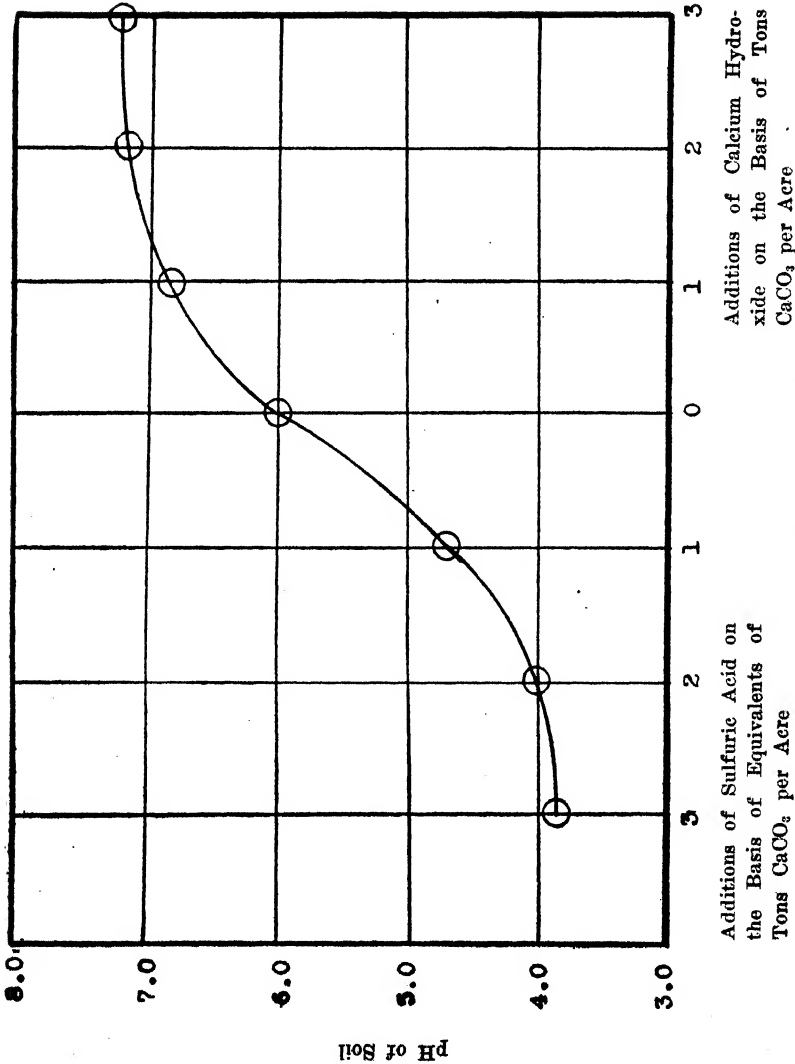


FIG. 2. Buffer Curve for Toa silt loam, II

Table 3 shows that Soil III was high in calcium which became more soluble as the acidity increased. The additions of lime also increased the solubility of calcium over that of the check, but to a lesser degree than the increase from the additions of sulfuric acid. Magnesium showed relatively less changes in solubility from additions of either acid or base. There was not much soluble manganese in this soil. At pH 4.3, after the addition of two tons of sulfuric acid per acre, there was 7.8 p.p.m. of soluble manganese, present. The solubility of manganese was too low to be measured above a pH of 4.7 in Soil III. No test for soluble iron was obtained for this soil. Phosphorus was slightly more soluble on the alkaline side than on the acid side. As in Soil II, this may be ascribed to the colloidal state of the alkaline filtrates, it being impossible to get clear filtrates. Potash was six times more soluble at a pH of 4.0, three tons of sulfuric acid per acre, than the check. The highest solubility was attained at pH 4.3, two tons of sulfuric acid per acre. The three ton addition of lime increased the solubility of potash over that of the check.

Soil III, like Soil II, is low in organic matter, (Table 7), and shows the same peculiar property in buffering the effects of acid and base; that is, the soil is much more highly buffered at the extreme ranges than near neutrality.

TABLE 4

RELATION OF CHANGE IN SOLUBILITY OF NUTRIENT ELEMENTS TO CHANGE IN REACTION IN TOA SILT LOAM, IV

Treatment	Ca p. p. m. *	Mg p. p. m.	Mn p. p. m.	Fe p. p. m.	P p. p. m.	K p. p. m.	pH
1.....	555	104	44	no test....	0.8	50	4.0
2.....	417	173	26	no test....	0.8	10	4.3
3.....	345	148	9	no test....	1.1	10	5.0
4.....	83	139	no test....	no test....	1.9	10	6.1
5.....	167	173	no test....	no test....	1.7	none.....	6.9
6.....	167	104	no test....	no test....	1.7	none.....	7.2
7.....	227	130	no test....	no test....	2.0	none.....	7.3

* On the basis of dry soil.

Table 4 shows the data for Soil IV. This soil was low in lime content but the solubility of lime increased sixfold at the lowest pH, 4.0, (three tons sulfuric acid per acre), over that of the check. Lime additions caused a slight increase in the solubility of calcium. The solubility of magnesium was slightly altered on the acid side but it decreased with the second and third applications of lime. Soil IV was as high as Soils I and II in its manganese content but in this particular soil manganese was soluble up to a pH of 5.0 only. No test for soluble iron was obtained for this soil. Phosphorus was ap-

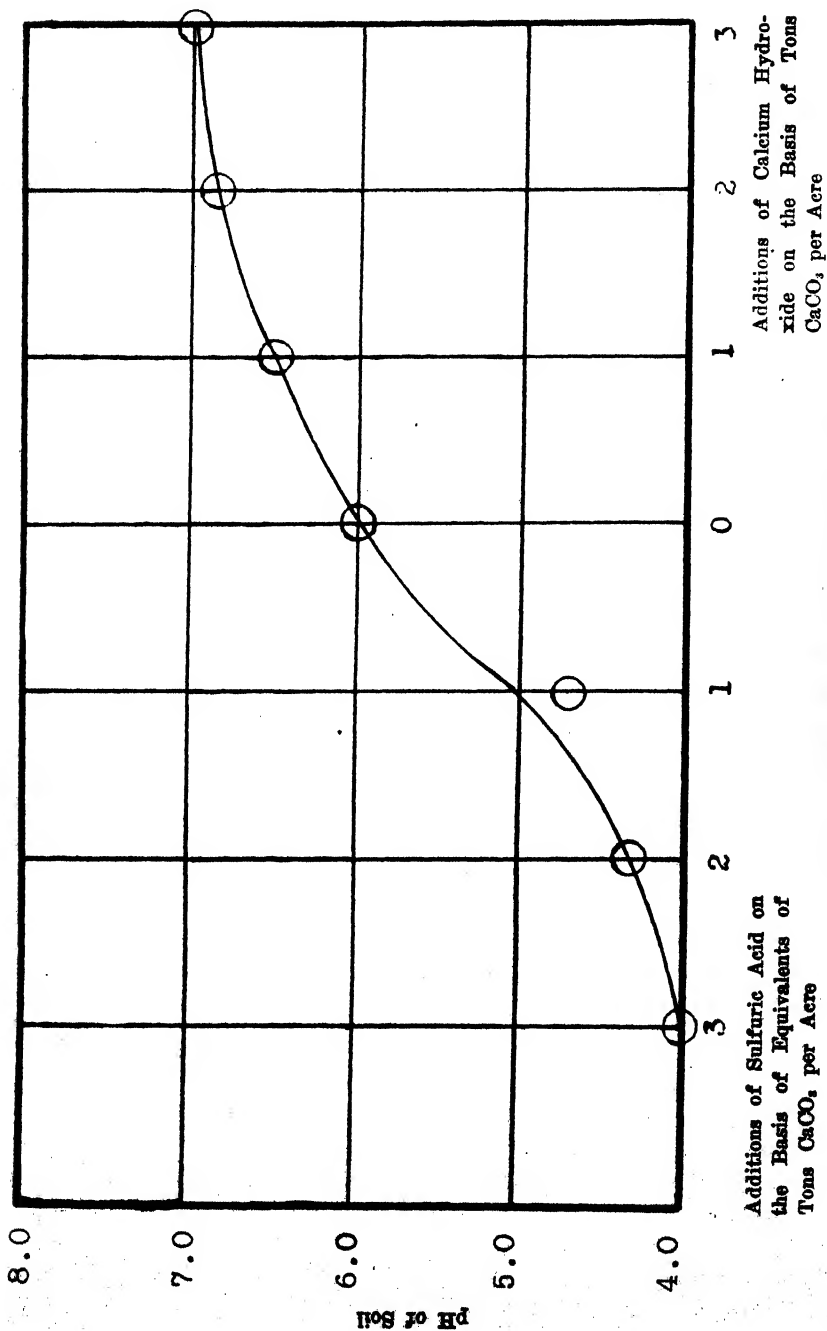


FIG. 3. Buffer Curve for Toa silt loam, III

parently less soluble on the acid side. The turbidity of the filtrates, as explained before, may account for this. This soil was low in potash content 10 p.p.m. The first two additions of sulfuric acid, (one and two tons per acre, respectively), failed to affect the solubility of potash but the third increment increased the solubility five times over that of the check. On the alkaline range the solubility was too little to be measurable.

It can be noted that Soil IV, like Soil II and III, was low in organic matter content. Like Soils II and III, this soil shows a low buffer capacity near neutrality and a high resistance to change in reaction at the extreme ranges. The solubilities of phosphorus and potassium are very low in this soil. This may be due to the high buffering power shown at the extreme ranges.

TABLE 5
RELATION OF CHANGE IN SOLUBILITY OF NUTRIENT ELEMENTS TO CHANGE
IN REACTION IN TOA SILT LOAM, V

Treatment	Ca p. p. m. *	Mg p. p. m.	Mn p. p. m.	Fe p. p. m.	P p. p. m.	K p. p. m.	pH
1.....	555	187	trace.....	no test....	1.6	7	4.2
2.....	450	148	trace.....	no test....	1.2	10	4.9
3.....	450	148	no test....	no test....	1.3	20	5.4
4.....	710	173	no test....	no test....	1.3	7	6.5
5.....	710	187	no test....	no test....	1.6	10	6.5
6.....	500	104	no test....	no test....	1.9	7	7.2
7.....	355	159	no test....	no test....	1.6	10	7.1

* On the basis of dry soil.

The differences in solubilities of the nutrient elements at varying pH values for Soil V can be seen in Table 5. This soil is the highest in soluble lime content, 710 p.p.m. The additions of acid did not increase the solubility of calcium. The same was evident with the additions of lime but to a larger extent. The solubility of magnesium did not vary appreciably on either range. Only a trace of manganese was seen at pH values of 4.2, (three tons of sulfuric acid per acre), and 4.9, (two tons of sulfuric acid per acre). No test for soluble iron was obtained. Phosphorus was slightly more soluble at a pH of 4.2 than at any other except at pH 7.2 which, as mentioned before, may be due to the lack of a clear filtrate. This soil was very low in potash. The check contained 7 p.p.m. Potash became most soluble with the addition of the first increment of sulfuric acid. Successive increments had little effect on the solubility of potash. Lime additions did not increase the solubility of potash.

Soil V is the highest soil of the six samples in organic carbon content, 2.35 per cent, (Table 7) and in total nitrogen content, 0.270

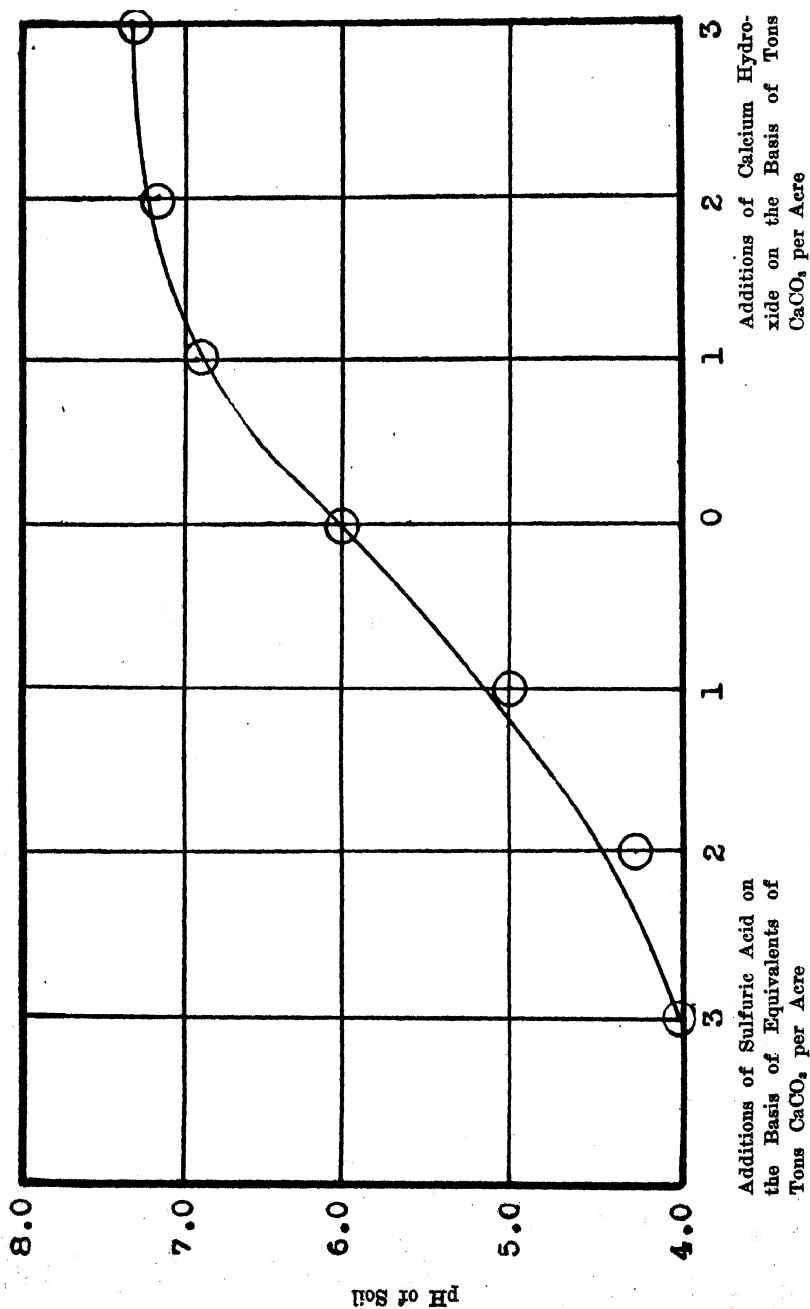


FIG. 4. Buffer Curve for Toa silt loam, IV

per cent. It is a highly buffered soil, being resistant to changes in reaction near neutrality. Although very low in potash the solubility of this nutrient element increased somewhat with the addition of one ton of sulfuric acid per acre. Lime additions did not affect the solubility of potash. The solubility of phosphorus was not increased markedly on either side and was comparatively low in this soil.

TABLE 6

RELATION OF CHANGE IN SOLUBILITY OF NUTRIENT ELEMENTS TO CHANGE IN REACTION IN TOA SILT LOAM, VI

Treatment	Ca p. p. m. *	Mg p. p. m.	Mn p. p. m.	Fe p. p. m.	P p. p. m.	K p. p. m.	pH
1.....	625	115	4	no test....	1.1	100	4.3
2.....	555	135	no test....	no test....	1.2	30	4.8
3.....	370	135	no test....	no test....	1.5	30	6.1
4.....	190	148	no test....	no test....	1.9	10	6.9
5.....	355	115	no test....	no test....	1.9	60	7.2
6.....	355	148	no test....	no test....	1.9	none.....	7.4
7.....	500	135	no test....	no test....	2.0	none.....	7.8

* On the basis of dry soil.

Table 6 shows that Soil VI responded markedly to both additions of sulfuric acid and lime, as shown by the increase in solubility of the lime content. The solubility of magnesium was changed only slightly from additions of sulfuric acid and lime. Soil VI is low in manganese. Manganese was insoluble above pH 4.8. Phosphorus was less soluble on the acid side. Additions of lime did not increase the solubility of phosphorus. Soil VI is low in soluble potash, but the additions of acid brought a marked increase in its solubility. The addition of one ton of lime per acre increased the solubility of potash but with the two and three ton increments the solubility of potash became too small to be measured. The reason for the increase from the first increment of lime may have been due to the stimulation of extra organic decomposition during the period of one week between the treatment and drying of the soil.

The organic carbon and nitrogen contents, 1.66 and 0.205 per cent respectively, show that this soil is intermediate in organic matter content and the buffer curves show that the soil is not so well buffered near neutrality as Soils I and V which contain more organic matter. However, Soil VI is more highly buffered near neutrality than Soils II and III whose buffer curves are of the sigmoid type which is characteristic of the soils low in organic matter.

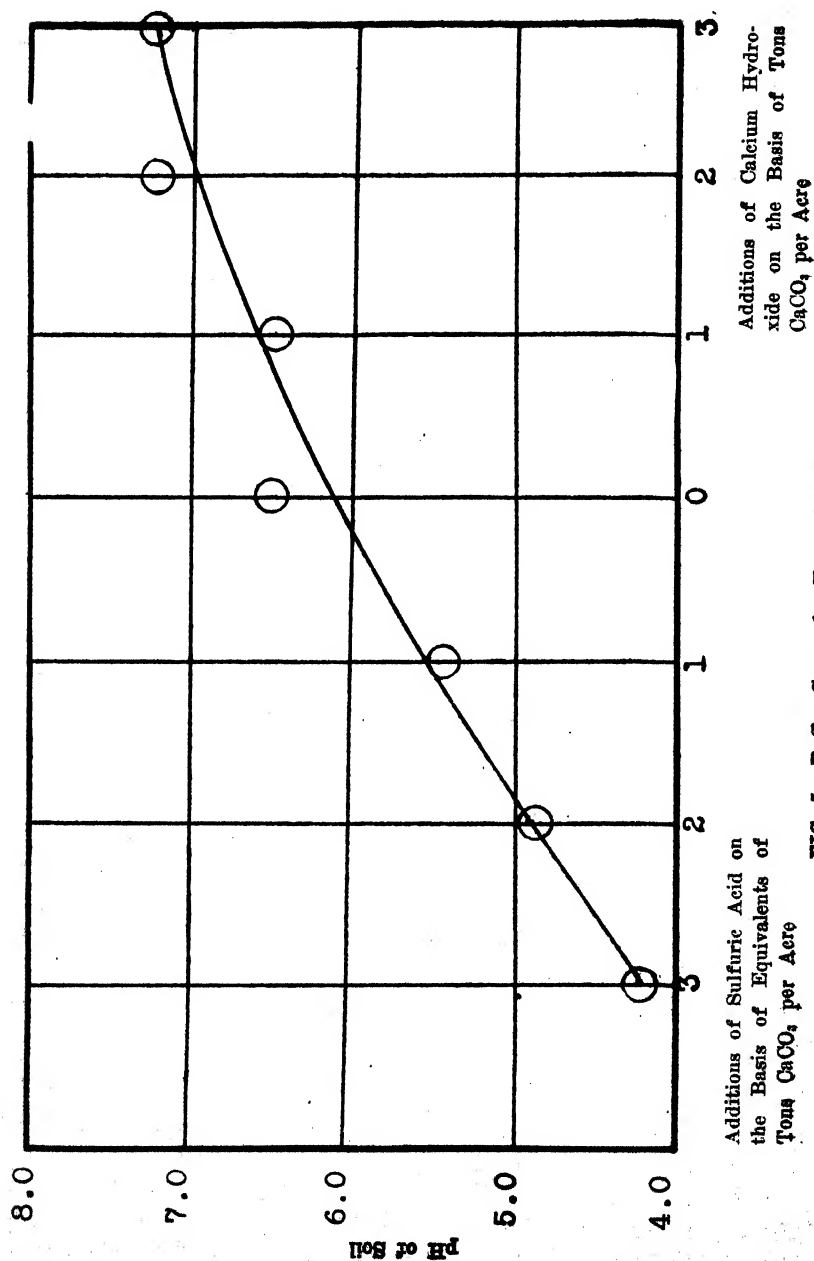


FIG. 5. Buffer Curve for Top silt loam, V

TABLE 7

THE ORGANIC CARBON AND NITROGEN CONTENTS AND RATIOS IN THE SIX SAMPLES OF TOA SILT LOAM STUDIED

No. of Soil	% Moisture	% Organic carbon	% Total N	C/N
I.....	1.55	2.25	0.235	9.5
II.....	0.79	1.19	0.126	9.4
III.....	1.15	1.44	0.150	9.6
IV.....	1.31	1.61	0.199	8.1
V.....	1.03	2.35	0.270	8.7
VI.....	0.69	1.66	0.205	8.1

It can be seen from Table 7 that the organic matter in the six samples of soil is well decomposed or largely in the humic state. This is indicated from the relatively narrow carbon-nitrogen ratios. From this it can be inferred that the changes in the buffering effect as related to the different amounts of organic matter in the samples is largely controlled by the lignin-humus fraction of the organic matter (10, 11) which makes up the major part of it.

SUMMARY

1. Organic matter, buffer capacity, and the relation of changes in reaction to the solubilities of the mineral nutrient elements in six samples of Toa silt loam were studied.

2. The buffer characteristics may vary rather widely within a given soil type. The buffer curves for different samples of Toa silt loam show that the presence of larger amounts of organic matter markedly increases the buffer capacity near neutrality. This is reflected in the flatter buffer curves. The samples which contained lower quantities of organic matter are most highly buffered at the extreme ranges of high acidity and basicity. This is indicated by typical sigmoid buffer curves.

3. The state of the decomposition of the organic matter in these samples indicates as has been shown by previous work that the buffering effect of the organic matter is associated with the lignin-humus fraction.

4. Additions of acid to the soil increased the solubility of the nutrient mineral elements. The increases in the solubilities were greatest in the samples that were low in organic matter.

5. Although liming increased the amount of soluble calcium in the soil, it did not decrease the solubility of phosphorus. The additions of lime decreased the solubility of potassium. The solubilities of iron and manganese were too low to be easily measured above pH 7.2 and in only one case above pH 5.0.

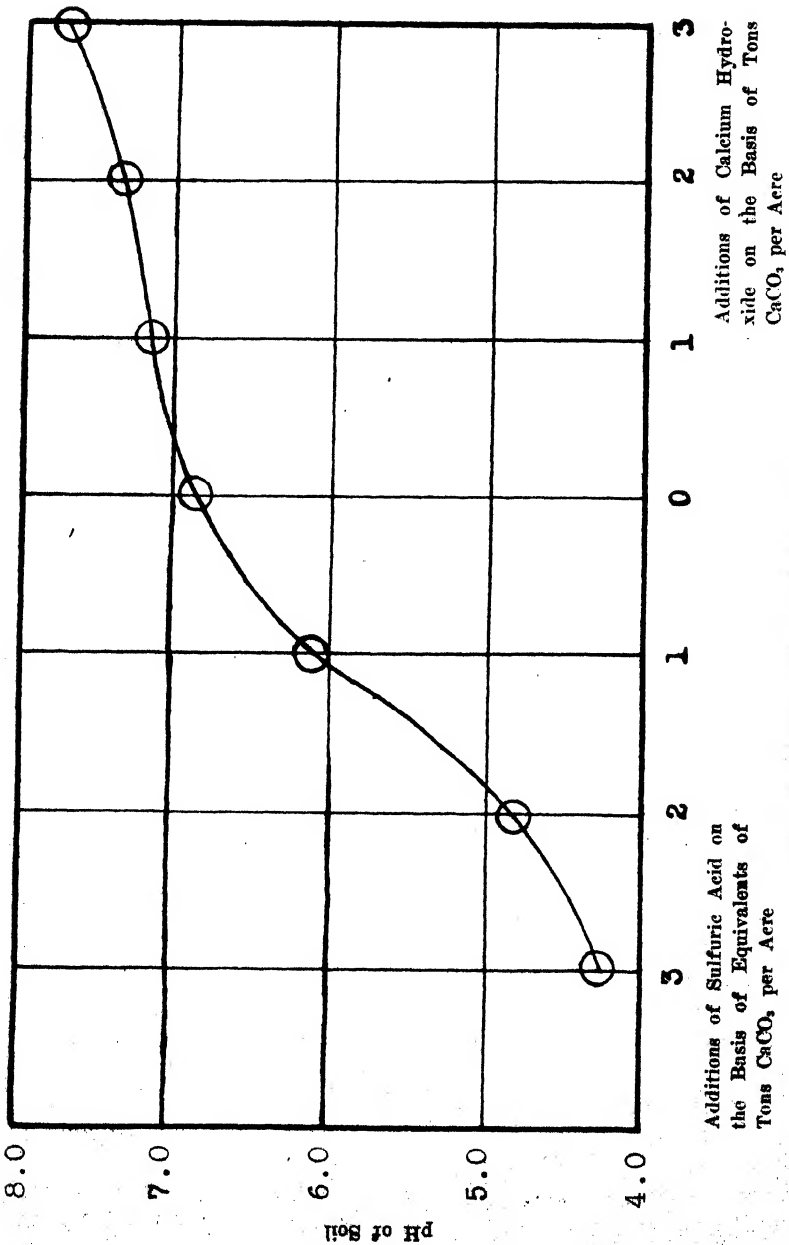


FIG. 6. Buffer Curve for Tox silt loam, VI

6. Additions of acid to the soil increased the solubility of potassium when the reaction was forced lower than pH 5.0. There was a greater increase in the solubility of potassium from the acid treatments in the samples that were lower in organic matter.

7. The solubilities of iron and manganese were increased from additions of acid. Manganese became much more soluble than iron from increased acidity and its solubility was more affected in the samples that were low in organic matter.

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MELVILLE T. COOK, Editor



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No. 3

RECORDS OF VIRUS DISEASES OF PLANTS IN PUERTO RICO

MELVILLE T. COOK, *Plant Pathologist*,
Agricultural Experiment Station, Rio Piedras, P. R.

These records are published at this time for the use of those workers who may be interested in the subject. Although the data is not complete it is made available for those who may want to use it.

AMARILIDACEAE

Eucharis grandiflora Planch (*E. Amazonica* Linstl.) This species is attacked by a mosaic which was reported by the writer in 1931. Up to the present time the writer has not found an individual of this species that did not show the disease. This disease is mentioned in the literature but the writer has not been able to find the first record. Bremer reported a stripe disease in 1926 which may be the same.

BIXACEAE

Maximiliana vitifolia (Willd) Krug & Urban. This is an introduced plant which has developed very pronounced mosaic patterns ranging through shades of green and yellow. It has been transmitted by budding. First published record.

BROMELIACEAE

Ananas ananas (L) Cockerell. The yellow spot and wilt diseases have been introduced from Hawaii on two shipments of slips of the smooth Cayenne variety, one in 1923 and the other in 1931. Both shipments were kept under observation for about two years and appeared to be perfectly healthy. In 1934 the yellow spot and wilt diseases (which are well known in Hawaii) were found in both plantings and they were placed under quarantine. These diseases corresponded to the descriptions of the diseases in Hawaii and have been controlled by controlling the ants.

A very similar symptom has appeared on the Cabezona pineapples in the vicinity of Lajas. This diseased condition has been known for several years and this variety has been degenerating, but the writer and others who have visited that region have failed to determine the cause of the trouble. Recent studies by the writer indicate that the disease is similar to yellow spot and wilt diseases of Hawaii but that the symptoms are not exactly the same. The writer plans to continue his studies on this disease.

The writer also found the spike disease in the Cabezonas recently. This disease was reported from Puerto Rico a number of years ago but has not been found during the past thirteen years that the writer has been on the Island.

COMPOSITAE

Bidens cynapiifolia H. B. K. This plant is subject to severe attacks of mosaic. In its mild form the disease produces a pattern which may be described as more or less blotchy in character. In the severe forms the leaves are more or less deformed.

CUCURBITACEAE

Cucumis sativus L. The mosaic disease was very severe during growing (winter) season of 1935-36. Many fields in the eastern part of the Island showed an infection of 100 percent. This is the first severe outbreak of this disease that has come to the attention of the writer during past thirteen years of residence on the Island. During that time the writer was never able to find more than one or two diseased plants in any planting.

DIOSCORIACEAE

Dioscorea sp. (cultivated variety). Some plants have been found showing well defined mosaic patterns and others that were uniformly chlorotic. The exact nature of this disease has not been determined.

EUPHORBIACEAE

Adenoropium gossypifolium L. A mosaic disease was reported by the writer in 1931. Recent studies indicate that it is not transmitted by the seeds but it is very easily transmitted by budding.

GRAMINEAE

Zea mays L. The writer has found a stripe disease of corn which appears to be the same as the stripe diseases reported by

Britton Jones (1923) in Trinidad and by Stahl (1927) in Cuba. This disease is characterized by chlorotic stripes following the veins of the leaves. These stripes are very narrow. The stripe symptoms appear on the upper 4 or 5 or 6 leaves only. In the first generation, some of the plants will be barren. In the second generation many seeds will not germinate, many plants will be dwarfed and barren, the larger plants will show the stripe symptoms and some of them will be barren. In the third generation these symptoms will be intensified and very few plants will produce grain. The disease is transmitted in the seeds.

LEGUMINOSAE

Bradburysia virginiana L. Kuntz. This species is subject to a well defined mosaic which is probably the same as the common bean mosaic. The experiments made by the writer indicate that it is not transmitted by seeds but *Aphis rumicis* is the probable vector.

Crotalaria anagyroides H. B. K. This species is subject to a mosaic which appears to be the same as the one on *C. striata* which was reported by the writer in 1931. Tests indicate that it is not transmitted in the seeds.

Crotalaria usaramocensis E. Baker. This species is subject to a mosaic which appears to be the same as the one on *C. striata* which was reported by the writer in 1931. Tests indicate that it is not transmitted by in the seeds.

Phaseolus lunatus L. This species is attacked by a virus which is probably the same as the common bean mosaic. Tests thus far indicate that it is not transmitted by the seeds. The writer suspects that *Aphis rumicis* may be the vector but we do not have any experimental proof.

MALVACEAE

Althae rosea (L.) Cav. This species is affected with a mosaic which was reported by the writer in 1935. Tests up to the present time indicate that the disease is not transmitted by the seeds but by an unknown insect vector.

MUSACEAE

Musa sp. The writers attention has been called to a mosaic disease of banana. This disease has been reported from other parts of the world. It is very rare in Puerto Rico.

Musa sp. A virus disease or virus-like disease is very abundant on the "enano" plantain in Puerto Rico. This disease appears to be very different from the bunchy top disease of the Far East and

does not correspond to the descriptions of diseases recently reported from Florida and Trinidad. Thus far it has been found on but one variety.

The spirals of diseased plants do not unroll properly. Sometimes they are bent to form hooks. Parts of the outer leaf may become dead, brown and torn by the growth of the inner parts. When the leaves of the spiral are first unrolled, they are chlorotic and crinkled and in severe cases become brown and die.

PASSIFLORACEAE

Passiflora laurifolia L. This is a very severe but rare chlorotic disease. The leaves are underdeveloped in size and irregular in shape. The writer has not demonstrated that this disease is due to virus.

STERCULIACEAE

Helicteres jamaicensis Jacq. A very pronounced case of a mosaic on this species was brought to the writer June, 1936, by Mr. W. A. McCubbin. Although we have no experimental proof that this is a virus disease the symptoms are so characteristic that it should be included in these records.

PHLOEM NECROSIS IN THE STRIPE DISEASE OF CORN

By MELVILLE T. COOK, *Plant Pathologist*,
Agricultural Experiment Station, Río Piedras, P. R.

Phloem necrosis has been reported for a number of plants infected with virus diseases, especially potatoes, tomatoes and beets, and may occur in many other plants infected with virus diseases. It is possible that it may be a diagnostic symptom in some types of virus diseases. However, this symptom must be studied in a much larger number of host plants and with a much larger number of viruses before its value in diagnosis and classification can be determined with certainty. We should also have a more complete knowledge of its appearance in plants with diseases due to other causes.

Gilbert (9) in a paper on correlation of foliage degeneration diseases of the Irish potato with variations of the tuber and sprout said—"Net-necrosis, of the phloem-necrosis type, is correlated in the tubers with a spindliness of sprout and seems to be a consistent symptom of leaf-roll. The necrosis symptoms are not persistent in the progeny tubers". A few years later (10) he reported that he had demonstrations of direct relation between leaf-roll and net necrosis. Quanjer (12) who has probably made a more extensive study of phloem-necrosis than any other worker on this subject made an attempt to classify and name potato viruses on the basis of the necrosis characters. Various forms of necrosis produced by several viruses in several species of plants have been studied by many workers during the past quarter of a century. It is a fruitful field of research for both plant histology and plant physiology.

November 17th, 1934, the attention of the writer was called to an outbreak of a white stripe disease of corn growing in a garden on the Agricultural Experiment Station farm. The symptoms of the disease corresponded with the descriptions by Stahl in Cuba (13) and Britton Jones (1) in Trinidad.

Some of the plants were very much dwarfed and did not produce ears. Others were full sized, some of them producing ears and others barren. The tendency to sterility was very pronounced. So many of the plants were sterile that it was difficult to find an ear satisfactory for seed. A plant in which the symptoms were fairly

good was selected and cross-pollinated from a plant in which symptoms were very pronounced. Chlorosis of the upper leaves was characteristic in all cases and the pattern was that of stripes which followed the veins of the leaves. In some cases a single white vein ran through a dense green leaf. In other cases the leaf was almost white.

Four plants were selected and pieces of the leaves fixed for sectioning. These pieces were sectioned and stained for study.

Phloem necrosis was found in every case ranging from a very slight to a very pronounced necrosis (figures 1 to 5). In some few cases a similar condition was found in the parenchyma (figures 7, 8, 9, 10, 11). In the most severe cases there was a complete breakdown (figure 6) of many cells. In some cases there was an increase in the number of fibrous cells next to the epidermis and a thickening of the walls of these cells. The phloem necrosis was accompanied by a thickening of the walls of the epidermis cells, the fibrous cells and sheath (figures 1 to 5 and 12, 13). In some cases these cells developed thick walls, although there was no phloem necrosis (figure 12). Esau (1934) in a paper on curly-top of sugar beet reported "a collapsed parenchyma that had undergone degeneration and necrosis".

In the most extreme cases the part of the leaf in which the stripe was located was very thin (figure 12), but this was not necessarily accompanied by phloem-necrosis.

The effect on the cell contents was very noticeable. The chloroplasts in the sheath cells of the bundles with necrosis and the parenchyma cells around such bundles were few in number (figure 14) while the corresponding cells in a section from a healthy plant showed a large number of chloroplasts (figures 15, 16). The chloroplasts in the cells in healthy plants were somewhat larger in size than those in cells from chlorotic regions of diseased plants. There was no evidence of disintegration but abundant evidence of inhibition. This is in harmony with the work of the writer on mosaic diseases of sugar cane and other plants (3, 4, 5). In this connection it should be noted that Esau reported disintegration in two papers on curly top of sugar beet (6, 7).

The nuclei in severely infected regions showed evidence of disintegration. Esau (7) reported hypertrophy of the nuclei in sugar beets infected with curly top.

Intracellular bodies were not seen.

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EXPLANATION OF PLATES

Figure 1.—Cross section of a leaf showing necrosis just above the lower epidermis.

Figure 2.—Cross section of leaf showing very slight necrosis.

Figure 3.—Another section showing same condition, but more pronounced.

Figure 4.—A section showing same conditions accompanied by a pronounced thickening of the epidermis.

Figure 5. A section showing necrosis and thickening of walls in the epidermis.

Figure 6.—A severe case in which there is a breaking down of cells in the fibro-vascular bundle.

Figure 7.—Necrosis and thickening cell walls in the parenchyma.

Figure 8.—Necrosis in the parenchyma adjacent to the sheath cells of the fibro-vascular bundle.

Figure 9.—A more pronounced case of necrosis in the parenchyma cells.

Figure 10.—A very pronounced case of necrosis next to the epidermis.

Figure 11.—A very pronounced necrosis surrounding a very small fibro-vascular bundle.

Figure 12.—A very pronounced thickening of cells of the epidermis. Note that the leaf is very thin in one place.

Figure 13.—Thickening of the walls of the epidermis and adjoining cells. Also the walls of the sheath cells surrounding a fibro-vascular bundle.

Figure 14.—Sheath cells and adjoining cells of a severely infected plant. Note that the chloroplasts are very few and very small.

Figure 15.—The same from a slightly infected plant.

Figure 16.—The same from a healthy plant.

PLATE I

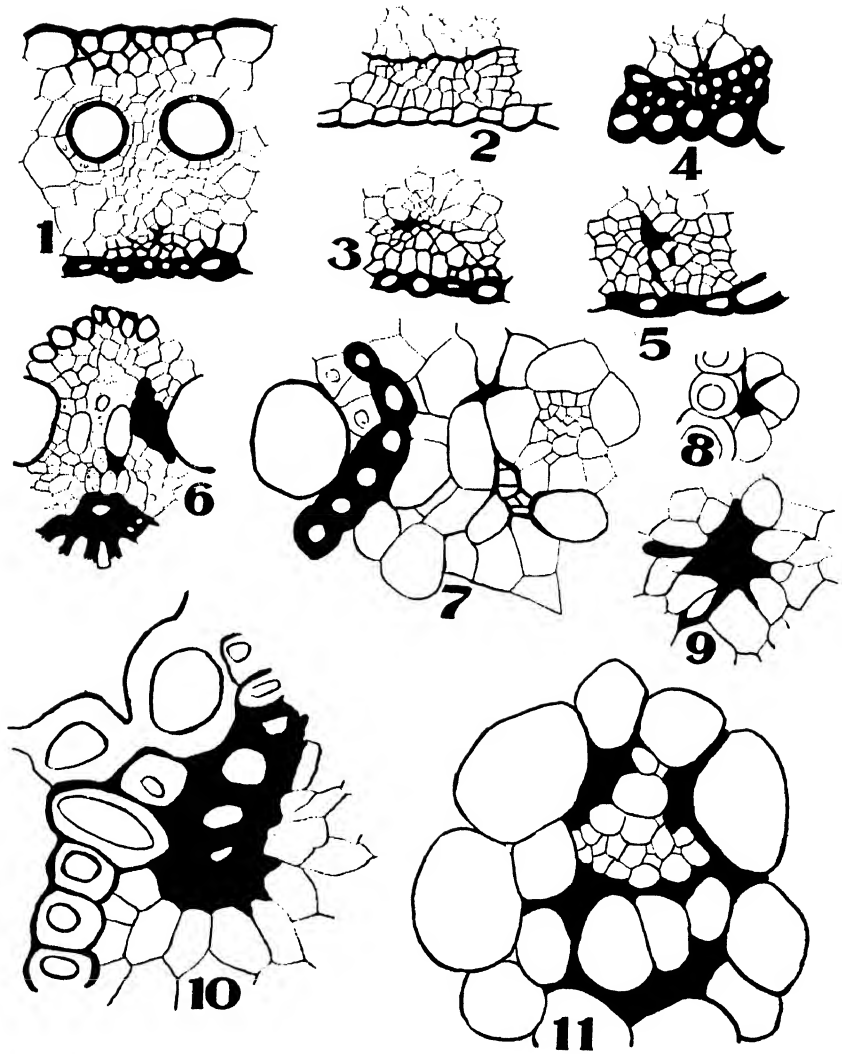
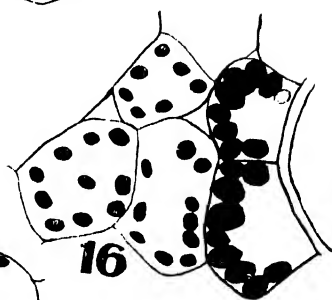
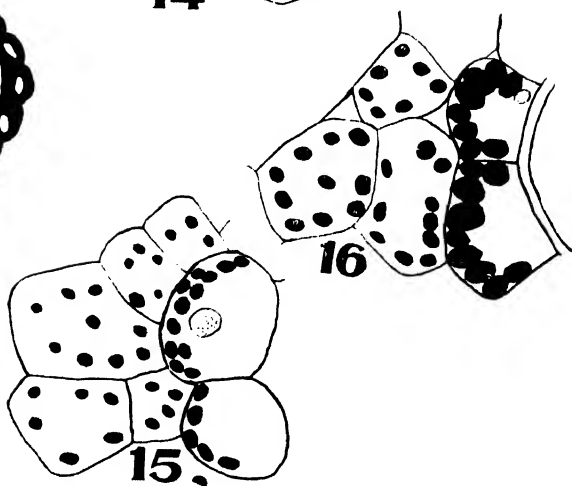
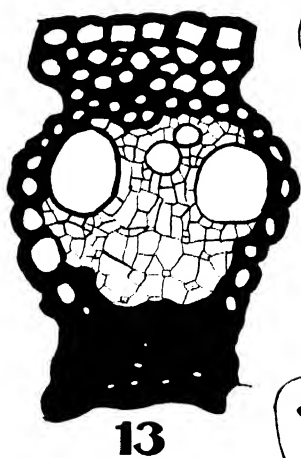
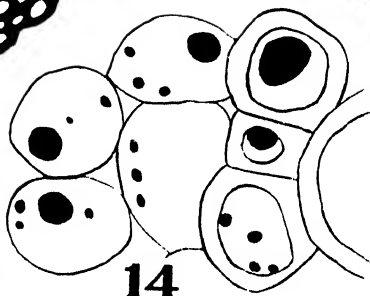
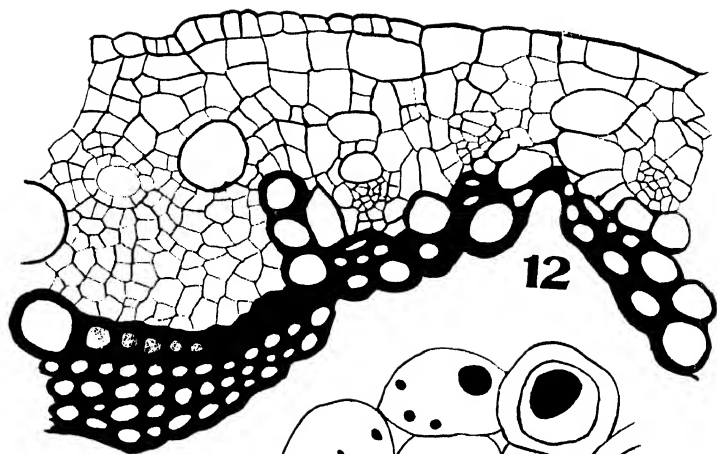


PLATE II



DESCRIPTIONS OF VIRUS DISEASES OF PLANTS: CRITICISMS AND SUGGESTIONS

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The work of the writer on the index of host plants of virus diseases and on the index of insect vectors of virus diseases of plants has brought to light a considerable number of incomplete and in some cases incorrect records in connection with virus diseases of plants. Most of these records were satisfactory at the time they were made but the lapse of time and the increase in the literature makes some of these early records rather obscure or indefinite. It is very doubtful if some of these records could have been made more definite or complete at the time the papers were written but there is no reason for our continuing to make similar errors in the future.

Tobacco mosaic was a satisfactory term until we found that there were several mosaic diseases of tobacco. It then became necessary to use a qualifying word such as "yellow mosaic", "interveinal mosaic", "aucuba mosaic", etc., and tobacco mosaic became "common tobacco mosaic". Our records would be much more satisfactory and much less likely to be misinterpreted in the future if the writers would insert qualifying terms before the names, even though it is a case of first virus disease reported on that particular host. Certainly the term "new virus disease" is unsatisfactory in all cases.

Records of new virus diseases of plants without definite names, numbers or letters and without descriptions of symptoms are not satisfactory and are likely to lead to confusion in the future. The term "new virus" is not satisfactory either now or in the future. A "new virus disease" today is an old virus disease tomorrow and another worker may present another "new virus disease" at any time in the future.

The use of the generic name of the host plant without the specific name is unsatisfactory. It is usually possible to secure the specific names except in the cases of cultivated varieties. In these cases the scientific name of the host from which the variety was derived should be given if possible.

When common names of host plants are used, the scientific names should be inserted in the titles, introductions or in parenthesis fol-

lowing the common name. The peanut of most parts of the United States is "gruber" in some parts of the country and in many parts of the world it is "ground nut", but it is *Arachis hypogea* in all parts of the world. Common names of host plants should rarely, if ever, be used unless accompanied by the scientific names.

The same rule applies to the use of common names of insect vectors. The writer has found a considerable amount of confusion arising from the use of common names of insect vectors. The use of the terms "leaf hoppers" or "aphis" may mean very little without explanation in any part of the world except the locality in which it was written. The writer has found that it is sometimes difficult to know whether two writers were referring to the same or two different insects. Common names of host plants and insect vectors may be satisfactory at the time and in the country in which a paper is written but may be very unsatisfactory in the future and in other parts of the world.

Reprints should always carry the name of the publication in which they appeared and dates of publication. The paging should be the same as in the original publication.

FIRST SUPPLEMENT

TO THE

HOST INDEX OF VIRUS DISEASES OF PLANTS *

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This supplement contains many records of host plants that were omitted from the first paper. Some of these records have been published since the publication of the first paper, others were not available to the compiler and others were held for more complete data which is now available. Furthermore, it has been found advisable to insert certain data which it was not intended to include when the first paper was published.

The preparation of the index is much more difficult than was anticipated by the compiler. Some of these difficulties were given in the first paper. Some of the additional difficulties are: (1) the recognition of many strains of viruses which give somewhat different symptoms, (2) the production of different symptoms on different host plants when inoculated with the same virus, (3) the mixture of viruses in a single host plant, (4) the variations of symptoms due to different methods of inoculation and (5) the influence of environmental factors, especially temperature, on the expression of symptoms. All these difficulties and many others of more or less importance have complicated the work of the compiler.

As a result of a study of the literature the compiler is of the opinion that it is impossible to make a satisfactory index until the various viruses have been identified and described. However, the compiler hopes that this index and its supplements may be useful to the students of virus diseases until a more satisfactory index can be made.

Ten families, more than 50 genera and about 150 species have been added to the index. Varieties of host plants have not been including, although it is well known that varieties within a species may react very differently to a single well known virus. No attempt has been made to classify the viruses. It is very evident to students of the subject that some of the diseases recorded under distinct

names may be due to a single virus and that the number of diseases recorded in the index is greater than the number of viruses recognized at this time.

This supplement makes this index fairly complete and up to date. There are many duplications and much confusion due to different names being applied to a single disease and to our lack of knowledge of the true nature of the viruses and the range of host plants of each virus. The compiler hopes that the index will be helpful for the workers and that it will aid in the making of a usable classification of the viruses.

AMARANTHACEAE

AMARANTHUS BLITOIDES

Mosaic, Doolittle and Walker, Wisconsin, 1925.

AMARANTHUS CAUDATUS

Curly top of sugar beet, Severin and Freitag, California, 1933,
I by *E. tenellus*.

AMARANTHUS DEFLEXUS

Curly top of sugar beet, Severin and Freitag, California, 1933,
I by *E. tenellus*.

AMARANTHUS RETROFLEXUS

Latent virus in potato, Jones and Burnett, Washington, 1934.

Fern Leaf of tomato, Jones and Burnett, Washington, 1935.

Same as cucumber mosaic.

Sugar beet mosaic, Mouravieff, Novinenko, Russia, 1932.

Curly top of sugar beet, Severin, California, 1919, NI.

AMARANTHUS TRICOLOR

Curly top of sugar beet, Severin and Freitag, California, 1933,
I by *E. tenellus*.

CELOSIA ARGENTEA

Curly top of sugar beet, Severin and Freitag, California, 1933,
I by *E. tenellus*. Also the variety *cristata*.

GOMPHRENA GLOBOSA

Curly top of sugar beet, Severin and Freitag, California, 1933,
I by *E. tenellus*.

AMARILIDACEAE

AGAVE CAUTALA

Mosaic, Phillipine Islands, No other data.

AGAVE RIGIDA var. SISALANA

Mosaic, Stanger, Belgian Congo, 1929, N.

AGAVE SISALANA

Mosaic, Phillipine Islands, 1925, No other data.

AMARYLLIS sp.

Spotted wilt of tomato, Gardner, Whipple and Tomkins, California, 1935. I. Reported a little later in England by Ogilvie.

EUCHARIS AMAZONICA

Mosaic. Cook, Puerto Rico, 1931, N. The compiler is of the opinion that this disease is very widely distributed. It may be the same as the stripe disease reported by Breiner in 1926.

HIPPEASTRUM sp.

Spotted wilt of tomato, K. M. Smith, England, 1936.

NARCISSUS sp.

Gray disease in the United States appears to be the same as the stripe disease in England.

NARCISSUS IMCOMPARABILIS

Spike disease, Wolley Dod, England, 1894, I am not sure that this is the date of the first record. It is mentioned in a paper by Gould in 1935. Some workers class it as a virus disease.

NARCISSUS TAZETTA

Yellow dwarf of onion, Henderson, Iowa, 1935.

APOCYNACEAE**NERIUM OLEANDER**

Chlorosis, F. F. Smith, Missouri, 1924.

VINCA (*Lochnera*) **ROSEA**

Spike disease, Varadaraja Iyengar, India, 1935.

ARACEA**HOMALOMENA CORDATA**

Chlorosis, F. F. Smith, Missouri, 1926.

RICHARDIA (*CALLA*) **AFRICANA**

Spotted wilt, Ogilvie, England, 1935.

ZANTHEDESCHIA AETHIOPICA

Spotted wilt of tomato, K. M. Smith, England, 1935, N.

BASELLACEAE**BASELLA RUBRA**

Mosaic of beet, Verplancke, Belgium, 1935.

Yellows of beet, Verplancke, Belgium, 1935.

BETULACEAE**CORYLUS AVELLANA**

Mosaic, Atanasoff, Bulgaria, 1935.

BIXACEAE**MAXIMILIANA VITIFOLIA**

Mosaic, Cook, Puerto Rico, 1936.

BORAGINACEAE

MERTENSIA VIRGINICA

Mosaic, Whetzel, New Jersey, 1928.

CAMPANULACEAE

CAMPANULA sp.

Mosaic. No data.

LOBELIA sp.

Spotted wilt of tomato, Holmes Smith, England, 1934.

LOBELIA CARDINALIS

Curly top of sugar beet, Freitag & Severin, California, 1935,
I from sugar beet by *E. tenellus*.

Cucumber virus 1, K. M. Smith, England, 1936.

LOBELIA ERINUS

Curly top of sugar beet, Severin, California, I by *E. tenellus*.
Bigarrure of potato, Verplancke, Belgium, 1935.

CARYOPHYLLACEAE

DIANTHUS BARBATUS

Mosaic, Woods, Washington, D. C., 1919, N.

DIANTHUS CARYOPHYLLUS var. *heddwigii*.

Curly top of sugar beet, Freitag Severin, California, 1933, I
from sugar beet by *E. tenellus*.

MONOLOPIA CHENOPODIODES

Aster yellows, Kunkel, New York, 1911. By *C. sexnotata*.

CHENOPODIACEAE

ATRIPLEX ELEGANS

Curly top of sugar beet. Severin. California. 1919.

ATRIPLEX PATULA

Mosaic of beet, Verplancke, Belgium, 1934.

BETA TRIGINA

Mosaic of beet, Verplancke, Belgium, 1935.

BETA VULGARIS

Cucumber mosaic, Johnson, Kentucky, 1930 Three types of a
new virus, Blattny, Czechoslovakia.

Tupfelmozaik, fleckenmozaik, punktmozaik and kauselmozaik,
Böning, Germany, 1927.

Sprenkel mosaic, nerven mosaic, marmor mosaic and poken mo-
saic, Verplancke, Belgium, 1935.

BLITUM EXSUCCUM

Mosaic of beet, Verplancke, Belgium, 1934

Yellows of beet, Verplancke, Belgium, 1934.

CHENOPODIUM ALBUM

- Mosaic of sugar beet, Mouravieff, Novinenko, Russia, 1932.
Yellows of beet, Verplancke, Belgium, 1934.

CHENOPODIUM BONUS-HERICUS

- Mosaic of beet, Verplancke, Belgium, 1934.
Yellows of beet, Verplancke, Belgium, 1934.

CHENOPODIUM MURALE

- Mosaic of beet, Verplancke, Belgium, 1934.
Yellows of beet, Verplancke, Belgium, 1934.

CHENOPODIUM QUINOA

- Mosaic of beet, Verplancke, Belgium, 1934.
Yellows of beet, Verplancke, Belgium, 1934.

SPINACEAE OLERACEAE

- Yellow cucumber mosaic, Hoggan, Wisconsin, 1933. I from cucumber.
Fern leaf of tomato, Jones & Burnett, Washington, 1935, Same as cucumber mosaic virus.

NOTE: Severin, California reported curly top of sugar beet on prickly winter spinach, 1934, I.

SPINACEA sp.

- Leaf curl, Wille, 1929, N.

SPINACEA OLERACEA

- Mosaic of beet, Verplancke, Belgium, 1934.

SUALEA MARITIMA

- Mosaic of beet, Verplancke, Belgium, 1934.
Yellows of beet, Verplancke, Belgium, 1934.

COMMELINACEAE**COMMELINA NUDIFLORA**

- Mosaic, Kunkel, Hawaii, 1932, N.

COMPOSITAE**ASTER sp.**

- New tomato disease, K. M. Smith, England, 1935.

ASTER (CALLISTEPHUS) SINENSIS

- Mosaic of beet, Verplancke, Belgium, 1934.

CALENDULA sp.

- Spotted wilt of tomato, K. M. Smith, England, 1935, N.
Cucumber virus 1, K. M. Smith, England, 1936.

CALENDULA OFFICINALIS

- Virus disease, Bijl, South Africa, 1931, N.

CALLISTEPHUS CHINENSIS

- Cucumber virus 1, K. M. Smith, England, 1936.

CENTAUREA CYANUS

Aster yellows, Kunkel, New York, 1928, I by *C. seznnotata*.

CINERARIA sp.

Spotted wilt of tomato, Ogilvie, England, 1935.

DAHLIA sp.

Stunt, Haskell, Georgia, 1928, N. Weiss reported a stunt the same year.

Virus disease, Brandenburg, Germany, 1928.

DAHLIA IMPERIALIS

Mosaic, Brierly, New York, 1933, I.

DAHLIA MAXONII

Mosaic, Brierly, New York, 1933, I.

DAHLIA VARIABILIS

Ring spot, Cannon, New Jersey, 1929, N.

Yellow ring spot, 1931.

Spotted wilt of tomato, K. M. Smith, England, 1932.

NOTE: Stunt and dwarf may be the same as mosaic.

Bigarrure of potato, Verplancke, Belgium, 1935.

DIMORPHOTHECA AURANTIACA

Tobacco mosaic, Grant, Wisconsin, 1934, I.

EMILIA FLAMMEA

Aster yellows, Kunkel, New York, 1931, I.

HELIANTHUS DEBILIS

Mosaic, Jagger, U. S. 1918, I from *C. sativus*.

HELICHRYSIUM BRACTEATUM

California aster yellow, Freitag & Severin, California, N. I from sugar beet by *E. tenellus*.

LACTUCA SATIVA

Spotted wilt of tomato, K. M. Smith, England, 1936.

Non-hearting, Ogilvie & Mulligan. 1933, Believed to be due to a mosaic virus.

NOTE: Severin, reported aster and celery yellows on prize head lettuce, California, 1934, I.

LACTUCA SCARIOLA

Mosaic, Curtis, Iowa, 1919, N.

MONOLOPIC CHENOPODIODES

Aster yellows, Kunkel, New York, 1931, I by *C. seznnotata*.

SONCHUS ABEVENSIS

Mosaic of sugar beet, Mouravieff, Novienko, Russia, 1932.

STOKESIA sp.

Mosaic, Curtis, Iowa, 1923.

TAGETES ERECTA

Tobacco mosaic, Grant, Wisconsin, 1934, I.

THELESPERMA HYBRIDUM

Yellows, Fukushi, Japan, 1931, I by insects.

TRICHOSANTHES CUCUMEROIDES

Mosaic, Kasai, Japan, 1924.

VERONIA CINEREA

Krul (or curl) & kroepoek (crinkle) of tobacco. Thung, Java, 1934.

VERONIA FASCICULATA

Mosaic, Curtis, Iowa, 1923, N.

ZINNIA sp.

New tomato disease, K. M. Smith, England, 1935.

Spotted wilt of tomato, K. M. Smith, England, 1936.

ZINNIA ELEGANS

Curly top of sugar beet, Severin and Freitag, California, 1933.

Bunchy top of tomato, McClean, South Africa, 1935, I.

Yellows, Severin, California, 1929, Same as aster yellows, celery yellows, lettuce yellows, etc.

Kroepoek, Kerling, Sumatra, 1933, I. May be first record. Also on *Nicotiana tabacum*. A similar disease has been reported by Thung in Java or Sumatra in 1932.

CONVOLVULACEAE**ARGYREIA CUNEATA**

Sandal spike. Suspected by Lushington, India, 1918.

CONVOLVULUS ARVENSIS

Virescence (teratology), Ryjkoff, Ukraine, 1934.

Stolbur, Koratshevsky, Russia, 1935.

IPOMOEA LOBATA

Curly top of sugar beet, Freitag and Severin, California, 1933.

I from sugar beet by *E. tenellus*.

CRUCIFERAE**ARABIS sp.**

Mosaic (Same as on *Cheiranthus cheiri*), K. M. Smith, England, 1935, N.

BARBAREA BARBAREA

Curly top of sugar beet, Severin, California. 1929, I.

BRASSICA ALBA

NOTE: Clayton (1930) reported mosaic on many cultivated Cruciferae, rutabagas, Brussels sprouts, cauliflower, white and black mustards, Chinese cabbage, turnips, rape, cabbage.

NOTE: K. M. Smith (1935) reported a mosaic on cabbage, Brussels sprouts and broccoli due to a virus from *Cheiranthus cheiri*. He also reported spotted wilt on cauliflower.

ORYZA SATIVA

Dwarf. Takada said that this disease was known as early 1883 and that it was first described in 1890.

PANICUM MILLIACEUM

Streak of sugar cane, Storey, South Africa, 1925, N.

PANICUM SANGUINALE

Sugar cane mosaic, Cottrell-Dormer, Australia, 1926.

PASPALUM BOSCIANUM

Sugar cane mosaic, Brandes & Klapaak, U. S. 1923, I.

PHYLLOSTACHYS PUBESCENS

Sugar cane mosaic, Brandes & Klapaak, U. S. 1923, N.

SACCHARUM OFFICINARUM

NOTE: Storey and McClean (1930) demonstrated that the viruses of streak of maize and cane were not identical.

NOTE: Storey, 1935 reported a mosaic on Agual cane in Natal, which he believed to be different from the common cane mosaic.

SETARIA AUREA

Sugar cane mosaic, Cottrell-Dormer, Australia, 1926.

SETARIA SULCATA

Streak of sugar cane, Fuller, South Africa, 1901. Not understood. Reported as a virus diseases by Storey & McClean 1930.

SETARIA VERTICILLATA

Mosaic, Storey, South Africa, 1924, N.

SORGHUM sp.

Streak of sugar cane, Fuller, 1901, N. Not understood as a virus disease.

Transvaal mosaic, Storey, South Africa, 1929, N.

TRAGUS RACEMOSUS

Streak of sugar cane, South Africa, 1930, N.

VALOTA INSULARIS

Mosaic, Brandes, Hawaii, 1928.

ZEA MAYS

NOTE: Storey (1931) reported a stripe in East Africa. The vector is *Peregrinus maidis*.

NOTE: Ocfemia (1931) reported a disease of corn in the Philippine Islands which resembled the Fiji disease of sugar cane.

NOTE: Storey and McClean, 1930, demonstrated that the viruses of streak disease of maize and cane were not identical.

Transvaal mosaic. Storey, South Africa, 1929, N. I. This disease does not attack sugar cane but it is transmitted by *Aphis maidis*.

IRIDACEAE

IRIS IMPERATI

Mosaic, Ogilvie, U. S. 1930, N. Observed in greenhouses.

IRIS TINGINGITANA

Mosaic, Ogilvie, U. S. 1930, N. Observed in greenhouses.

Mosaic or stripe, K. M. Smith, England, 1936.

IRIS XIPHIUM

Mosaic or stripe, K. M. Smith, England, 1936.

IRIS XIPHIUM HYBRIDUM

Mosaic or stripe, K. M. Smith, England, 1936.

IRIS XIPHONOIDES

Mosaic or stripe, K. M. Smith, England, 1936.

LABIATAE

COLEUS BLUMET

NOTE: It has been suggested that some of the variegations in this and other species may be due to a virus but there is no proof.

GLECHOMA HEDERACEA

Periclinal variegations. Funaoka, Japan, 1924.

NEPETA CATARIA

Mosaic from eucumber, Doolittle & Walker, U. S. 1925.

Ring spot of tobacco, Doolittle & Walker, Wisconsin, 1926. I from *C. sativus*.

LEGUMENOSACEAE

ARACHIS HYPOGAEA

NOTE: Hayes reported three types of rosette in Gambia.

Pale dwarf (juvenile disease), Hartley, Java, 1927. Resembles a virus disease but probably due to other causes.

Clump disease, Sundaranaman, India, 1928, N. Similar to the rosette of South Africa.

CANAVALIA ENSIFORMIS

Mosaic, Hopkins, South Rhodosia, N. 1931. N.

CANAVALIA LINEATUA (*C. obtusifolia*)

Mosaic, Ogilvie, 1927.

CYTISSUS HIRSUTUS

Chlorosis Baur, Germany, I from *Laburnum vulgare*.

DOLICHUS BIFLORUS

Ring spot of tobacco, Wingard, Virginia, 1928. I from tobacco and back.

DOLICHOS LABLAB

Mosaic, South Rhodosia, 1931, N.

DOLICHOS LUPINIFLOERUS

Mosaic, Hopkins, South Rhodosia, 1933, N.

LATHYRUS ODORATUS

Mosaic, Doolittle & Jones, U. S. 1925. I from *Trifolium pratense*.

Sore shin, Chamberlain, Australia, 1935.

LUPIN sp.

Cucumber 1, K. M. Smith, England, 1936.

LUPINUS ANGUSTIFOLIUS

Sore shin, Chamberlain, Australia, 1935. Also attacks sweet pea, garden pea and broad bean.

LUPINUS LUTEUS

Mosaic, Merkel, Germany, 1929.

Chlorosis, Scholz, Germany, 1932. Known for many years. Not proved to be a virus.

NOTE: Sore shin which appears to be the same has been reported in Australia. Also occurs on *L. angustifolius* in Germany, Kohler, 1935.

LUPINUS POLYPHYLLUS

Spotted wilt of tomato. Ogilvie, England, 1935.

MALCONIA MARITIMA

Aster yellows, Kunkel, New York, 1931. I by *C. sexnotata*.

MEDICAGO sp.

Witches' broom, Edwards, Australia, 1935. Commonly known as spindle shoot, mistletoe, bunchy toe and kurrajong.

MEDICAGO LUPULINA

Mosaic, Harrison, New York, 1935. I from *Phaseolus vulgaris* by Aphid.

MELILOTUS sp.

New virus of the ring spot type, Henderson, 1934. It attacks tobacco.

Mosaic, Elliott. Arkansas. 1921. Inoculations from *M. alba* and *T. pratense*.

MELILOTUS ALBA

Ring spot of tobacco. Henderson & Wingard, Virginia, 1931, N. Mosaic, Harrison, New York, 1935. I from *Phaseolus vulgaris* by *Aphis* sp.

PHASEOLUS ACONITIFOLIUS

Mosaic, Reddick & Stewart, New York, 1919.

PHASEOLUS ATROPURPUREA

Curly top of sugar beet, Severin & Henderson, California, 1928.

PHASEOLUS LUNATUS

Mosaic, McClintock, Virginia, 1917.

NOTE: A bean mosaic of some kind was reported from Russia in 1899. Clinton reported a chlorosis of lima bean from Conn. in 1908.

PHASEOLUS SATIVUS

Mosaic, Severin & Henderson, California, 1928.

PHASEOLUS VILLOSA

Curly top of sugar beet, Severin and Henderson, California, 1928.

PHASEOLUS VULGARIS

Yellows, Smith & Barker, Haiti, 1930. Apparently caused by *Empoasca* sp. but not definitely settled.

Yellow mosaic, Pierce, Wisconsin, 1934, N. He reported that the host range was very nearly that of the common bean mosaic virus.

Sore shin, Chamberlain, Australia, 1935. I from *Lupinus* to broad bean.

NOTE: Zaumeyer (1934) reported that the mosaic of the pea, alsike clover, white sweet clover, alfalfa and sweet pea were transmitted to *P. vulgaris*. Red clover mosaic was not transmitted to these hosts.

Yellow mosaic. Harrison, New York, from alsike clover, red clover, white sweet clover and from black medick, 1935.

Mosaic, Harrison, New York, I from white sweet clover, alfalfa and bean, 1935.

Common bean virus No. 1, tobacco mosaic virus No. 1 and ring spot of tobacco virus, Price, 1934.

Alfalfa mosaic virus No. 2, Price, 1934.

Yellow bean virus No. 2, Price, 1934.

Johnson's tobacco mosaic virus No. 1, Stanley, New Jersey, 1936.

Common bean mosaic virus 1, Pierce, Idaho, 1935.

Yellow bean virus No. 2, Pierce, Idaho, 1935.

Enation pea mosaic virus (pea virus 2), Pierce, Idaho, 1935.

Common pea mosaic virus (pea virus 2), Pierce, Idaho, 1935.

Common soy bean mosaic virus 1, Pierce, Idaho, 1935.

Broad bean local-lesion virus obtained from red clover, Pierce, Idaho, 1935.

PISUM SATIVUM

Mosaic, Blaringham, Canada, 1922. I from *P. sativum* to *T. pratense* L. *odoratus* by Doolittle & Jones, 1925.

Sore shin, Chamberlain, Australia, 1935, I from *Lupinus angustifolius*.

PISUM sp.

Mosaic, McClintock, Virginia, 1917, I from *Arachis hypogaea*.

Mosaic, Böning, Germany 1927, I from *Vicia faba*.

RADICULATA SYLVESTRIS

Mosaic, McKinney, Canary Islands, 1928, N.

TRIFOLIUM HYBRIDUM

Mosaic, Harrison, 1935. I by Aphis from *Phaseolus vulgaris*.

Mosaic, Dickson, Canada, 1922, I from *T. pratense*. Böning reported a mosaic from Germany, transmitted from *Vicia faba*. Harrison of New York (1935) reported transmission of mosaic from *Phaseolus vulgaris* by Aphis.

TRIFOLIUM PRATENSE

Mosaic, Elliott, Arkansas, 1924, N. Observed first in 1917. Transmitted from *T. pratense* by Dickson, Canada, 1922.

TRIFOLIUM REPENS

Mosaic, Elliott, Arkansas, 1921, I from *M. alba* and *T. pratense*.

VICIA FABA

Mosaic, Elliott, Arkansas, 1921, I from *M. alba* and *T. pratense*.

A mosaic which is transmissible to peas, crimson clover and red clover was reported from Germany 1927 by Böning.

Curly top of sugar beet, Severin, California, 1928, N.

VICIA FABA MAJOR

Mosaic of beet, Verplancke, Belgium, 1934.

VIGNA SINENSIS

New virus disease of tomato, K. M. Smith, England, 1935.

Necrosis disease of tobacco, K. M. Smith & Bald, England, 1935.

Celery virus, 1, Wellman, Florida, 1934.

LILIACEAE

ALLIUM ASCOLONICUM

Yellow dwarf of onion, Henderson, Iowa, 1935.

LILIUM AURATUM

A virus disease, Pape, Germany, 1934.

Rosette, K. M. Smith, England, 1936.

LILIUM CANDIDUM

Mosaic, Woods, U. S. 1927, N. Cause not known. He also reported Bermuda lily disease on *L. harrisi*, *L. auratum* and *L. candidum* in 1897.

LILIUM HARRISII

Mosaic, 3 types, Ogilvie, New York, 1930.

LILIUM LONGIFLORUM var. *eximium*

Yellow flat, Ogilvie, 1928, N. May better be called rosette.

Stunt, Pape, Germany, this record included the varieties *crabax* and *formosum*. 1934.

LILIUM LONGIFLORUM var. *giganteum*.

Rosette, K. M. Smith, England, 1936.

TULIP sp.

Clotting is an expression of full breaking in certain varieties. Mc Kenny Hughes, England, 1934.

Falling disease, Pinkhof, Holland, Cause unknown.

LOBELIACEAE (See Campanulaceae)

MALVACEAE

ALTHAEA FICIFOLIA

Chlorosis, Lindemuth, Graft from *Abutilon striatum* var. *Thompsonii*.

ALTHAEA NARBONENSIS

Variegations, Lindemuth, Germany, 1902. Transmitted from *Abutilon* by grafting.

ALTHAEA ROSEA

Chlorosis, Baur, Germany, from *Abutilon striatum* var. *Thompsonii* by grafting.

ABUTILON ARBOREUM

Mosaic, Baur & Lindemuth, Germany, I by graft.

ABUTILON AVICENNAE

Mosaic, Baur & Lindemuth, Germany, I by graft from *A. striatum* var. *Thompsonii*.

ABUTILON DARWINI

Mosaic, Baur & Lindemuth, Germany. I by graft from *A. striatum* var. *Thompsonii*.

Mosaic, Baur & Lindemuth, Germany. I by graft from *A. striatum* var. *Thompsonii*.

ABUTILON ESCULENTUM

Mosaic, Baur & Lindemuth, Germany. I by graft from *A. striatum* var. *Thompsonii*.

ABUTILON HYBRIDUM

Mosaic, Baur & Lindemuth, Germany. I by graft from *A. striatum* var. *Thompsonii*.

ABUTILON INDICUM

Mosaic, Baur & Lindemuth, Germany. I by graft from *A. striatum* var. *Thompsonii*.

ABUTILON INEQUALE

Mosaic, Baur & Lindemuth, Germany. I by graft from *A. striatum* var. *Thompsonii*.

ABUTILON MEGAPOTOMICUM

Mosaic, Baur & Lindemuth, Germany. I by graft from *A. striatum* var. *Thompsonii*.

ABUTILON SELLOWIANUM

Mosaic, Baur & Lindemuth, Germany. I by graft.

ABUTILON VENOSUM

Mosaic, Baur & Lindemuth, Germany, I by graft from *A. striatum* var. *Thompsonii*.

Gossypium sp.

Azerbaijan, Verderevsky. Russia, 1935.

NOTE: Leaf curl of cotton appears to have been reported first from Nigeria in 1912 by Farquarson. It was described in 1926 by Jones & Mason. It is especially prevalent on *G. peruvianum* and *G. vitifolium*.

NOTE: Hertsch (1927) reported two types of infectious chlorosis in *Malvaceae*, A & B.

"A" on *ABUTILON THOMPSONII* var. *Thompsonii*, A. DWARINI, A. TESSETATUM & A. STRIATUM.

"B" appeared spontaneously on T. DWARINI & *LAVATERA ARBOREA*.

"A" attacks A. INDICUM & *SIDA NAPAEA* very severely. Less severe on A. SELLOWIANUM, *MALVA BOREALIS*, M. CRISPA, *ALTHAEA OFFICINALIS* and A. STRIATUM.

He also reported an infectious chlorosis on *Euonymus*, *Jasminum*, *Fraxinus*, *Castanea* and *Laburnum*.

Mosaic, Berry, Georgia, 1918, N.

HIBISCUS ESCULENTUS

Leaf curl of cotton, Farquarson, Nigeria, 1912, N.

HIBISCUS SABDARIFFA

Leaf curl of cotton, Kirkpatrick, Sudan, 1931.

MALVA SYLVESTRIS

Chlorosis, Lindemuth, Graft from *Abutilon striatum* var. *Thompsonii*.

SIDA ABUTILON

Variegations, Davis, Missouri, 1929.

SIDA MOLLIS

Chlorosis, Lindemuth, Graft from *Abutilon striatum* var. *Thompsonii*.

SIDALCEA CANDIDA

Chlorosis, Lindemuth, Graft from *Abutilon striatum* var. *Thompsonii*.

MARTYNIACEAE**PROBOSCIDEA LOUISIANA**

Mosaic of tobacco, Jones & Burnett, Washington, 1933.

MELIACEAE**CIPADESSA FRUCTICOSA**

Sandal spike, Suspected by Lushington, India, 1918. Also mentioned by Iyengar in 1935. Confirmed by Varadaraja Iyengar & Rangaswami (manuscript) 1935.

MORACEAE**FICUS** sp.

Mosaic, Condit & Horne, California, 1933.

FICUS PARCELLI

Variegations resembling mosaic. F. F. Smith, Missouri, 1926.

FICUS TSIELA

Spike similar to Sandal, Lushington, India, 1916.

HUMULUS sp.

Squirt mosaic, Blattny, Czechoslovakia, 1927, N.

MUSACEAE**MUSA sp. (banana)**

Mosaic, Ogilvie, Bermuda, 1917 and by Roque (not published) in Puerto Rico in 1934.

MUSA BANKSI

Bunchy top, Magee, Australia, 1927. He says that all species are attacked.

MUSA CAVENDISHII

Bunchy top, Magee, Australia, 1927.

MUSA SAPIENTUM

Bunchy top, Jones, Egypt, 1935.

MUSA TEXTILIS

Bunchy top, Ocfemia, Philippine Islands, 1926.

Mosaic (suspected), Calinisan, Philippine Islands, 1934.

NOTE: The bunchy top *M. textilis* and of bananas appear to be due to two distinct viruses.

NYCTAGINACEAE**BOUGAINVILLEA GLABRA**

Chlorosis, F. F. Smith, Missouri, 1926.

OLEACEAE**FRAXINUS sp.**

Mosaic, Atanasoff, Bulgaria, 1935.

JASMINUM OFFICINALE

Infectious chlorosis, John Lawrence, England, 1715. See Orton in *Phytopathology* 14:198, 199, 1924.

JASMINUM REVOLUTA

Chlorosis from *J. officinale*, Masters, England, 1869.

SYRINGA sp.

Mosaic. Atanasoff. Bulgaria. 1935.

ONAGRACEAE**FUCHSIA MAGELLANICA**

Mosaic, McKinney, Canary Islands, 1929, N.

PAPAVERACEAE**ESCHSCHOLZIA CALIFORNICA**

Curly top of sugar beet, Severin & Freitag, California, 1934. I.

PAPAYER NUDICAULE

- Curly top of sugar beet, Freitag & Severin, California, 1933.
I from sugar beet by *E. tenellus*.
Spotted wilt of tomato, Holmes Smith, England, 1934. N.

PHYTOLACCAOACEAE

PHYTOLACCA DECANDRA

- Cucumber mosaic, Doolittle & Walker, 1923.
Yellow mosaic, Hoggan, Wisconsin, 1935. I from cucumber.
Mild mosaic, Hoggan, Wisconsin, 1935. I from cucumber.
Produces local chlorotic symptoms.
Fern leaf of tomato, Jones & Burnett, Washington, 1935. Same
as cucumber mosaic.

PITTOSPORACEAE

PITTOSPORIUM TOBIRA

- Variations, F. F. Smith, Missouri, 1926.

PLANTAGINACEAE

PLANTAGO LANCEOLATA

- Mosaic of beet, Verplancke, Belgium, I. 1932.
Yellows of beet, Verplancke, Belgium, I. 1932.

PLANTAGO MAJOR

- Celery yellows, Severin, California, 1928, N. Probably same
as aster yellows.
California aster yellows, and celery yellows, Severin, California,
1934, I.

PLUMBAGINACEAE

ARMERIA ALPINA

- Ring spot of tobacco, Wingard, Virginia, 1928. I from tobacco
and back.

LIMONIUM SUWORWI

- Ring spot of tobacco, Wingard, Virginia, 1928, I from tobacco
and back.

POLYGONACEAE

POLYGONUM HYDROPIPER

- Ring spot of tobacco, Wingard, Virginia, 1928, I.

RUMEX ACETOSA

- Leaf curl, Willie, Germany, 1929, N.

RUMEX BRITANICA

- Mosaic, Fernow, New York, 1923, N.

RUMEX CRISPUS

- Potato mosaic, van der Meulen, Holland, 1928.

RUMEX LANCEOLATA

- Mosaic, Grainger & Cockerham, England, 1930, N.
Mottling, Green, England, 1930, N.

RUMEX OBTUSIFOLIUS

Chlorosis & mosaic, Grainger & Cockerham, England, 1930, N.

RUMEX SCUTATUS

Mosaic & yellows of beet, Verplancke, Belgium, I.

PORTULACACEAE**CALANDRINA MANZIESII**

Curly top of sugar beet, Carsner & Stahl, California, 1924, I
from sugar beet.

PRIMULACEAE**POLYANTHUS** sp.

Cucumber virus 1, K. M. Smith, England, 1936.

PRIMULA OBCONICA

Cucumber virus 1, K. M. Smith, England, 1936.

PRIMULA SINENSIS

Spotted wilt of tomato, Ogilvie, 1935, I from sugar beet by *E. tenellus*.

Cucumber virus 1, K. M. Smith, England, 1936.

RANUNCULACEAE

(hybrid)

AQUILEGIA ep.

Mosaic, F. F. Smith, Missouri, 1926. I.

DELPHINIUM sp.

A virus disease, Valleau, Kentucky. 1932.

Yellows, Richards. Utah, 1928. Not proved to be a virus disease.

Disease resembling ring spot of tobacco, Valleau, Kentucky, 1928.

Cucumber virus 1, K. M. Smith, England, 1936.

NASTURTIUM OFFICINALE

Curly top of sugar beet, Freitag & Severin, California, 1933,
I from sugar beet by *E. tenellus*.

RANUNCULUS ASIATICUS

Curly top of sugar beet, Severin & Freitag, California, 1934, N.

RHAMNACEAE**SCUTIA INDICA**

Spike of sandal. No data.

ZIMPHUS OENOPHIA

Spike of Sandal suspected by Lushington, India, 1918. Iyengar reported it in 1935. Confirmed by Varadaraja, Iyengar & Rangaswami (manuscript) 1935.

ROSACEAE**NAPOLEON CHERRY**

Mottle leaf, Zeller, Oregon, 1935. Not definitely proved to be virus disease.

PRUNUS AVIUM

Mosaic, Christoff, Bulgaria, 1934.

PRUNUS CERASUS

Mosaic, Christoff, Bulgaria, 1934.

PRUNUS DIVARICATA

Mosaic, Christoff, Bulgaria, 1934.

PRUNUS INTERSTITIA

Mosaic, Christoff, Bulgaria, 1934.

Mosaic or yellows with green veins, Blattny, Czechoslovakia, 1930, N.

PRUNUS MAHALEB

Mosaic, Christoff, Bulgaria, 1934.

PRUNUS PERSICA

Rosette, E. F. Smith, Georgia, 1888, N. Successfully transmitted by grafting peach plum, cherry and almond, McClin-
tock, 1923.

Spike of peach, similar to spike of Sandal, Howard, India, 1919.
Virus from plum, Valleau, Kentucky, 1932. Transmitted from
plum to peach by budding.

Ring spot like disease, Valleau, Kentucky, 1932. Transmitted
from *P. salicina* by budding.

NOTE: Kunkel (1936) said that Peach yellows and little peach were related
but that rosette was due to a very different virus.

PRUNUS SALICINA

Ring spot like disease. Valleau, Kentucky, 1932. Transmitted
by budding.

NOTE: Rietsema (1930) reported a virosis on cherry, plum and peach.
Holland.

PRUNUS SPINOSA

Mosaic, Christoff, Bulgaria, 1934.

PYRUS MALUS

Crinkle, Robbins, Wisconsin, 1919.

Mosaic, Blodgett, New York, 1923, N.

Ringspot like disease, Valleau, Kentucky, 1932. Virus char-
acter not demonstrated.

Bitter pit. This disease has been known in many countries and
for many years. Atanastoff (1934) placed in the virus group.
The virus character has not been demonstrated to the satisfac-
tion of all students of the subject.

Virus disease of apple, pear and quince. Christoff, Bulgaria.
1934.

ROSA sp.

Mosaic, Weiss & McWhorter, Washington & Oregon, 1930. Chris-
toff, Bulgaria. 1934.

Die back & wilt, Grieve, Australia, 1931.

Mosaic, White, New Jersey, 1928.

ROSA GYMNOCARPA

Mosaic, McWhorter, Oregon, 1931, N.

ROSA MULTIFLORA

Chlorosis, Weiss & McWhorter, Washington & Oregon, 1930.
Transmitted by grafting.

ROSA ODORATA

Chlorosis, Weiss & McWhorter, Washington & Oregon, 1930.

ROSA RUBINOSA

Dwarf of loganberry, Zeller, Oregon, 1925. Same as on Loganberry.

Wilt or die back, Grieve, Australia, 1931, N. I.

RUBUS sp.

Yellows of raspberry was reported by Stewart of New York in 1902.

Mosaic on Loganberry, Zeller, Oregon, 1924.

Fern leaf and Witches' broom, Zundel, Pennsylvania, 1931. N.
English mosaic of red raspberry, Zeller, Oregon, Washington and Idaho, 1936. Imported from England.

RUBUS IDAEUS var. *strigosus*

Mosaic & curl, Zeller, Oregon, 1923.

RUBUS INNOMINATUS

Mosaic, Wilcox, 1926.

RUBUS LACINIATUS

Mosaic, Zeller, Oregon, 1923.

RUBUS NEGLECTUS

Mosaic, Zeller, Oregon, 1923.

RUBUS OCCIDENTALIS var. *leucodermis*

Mosaic, Zeller, Oregon, 1923.

RUBUS PHOENICOLASIUS

Mosaic, Zeller, Oregon, 1923.

SORBUS ACUPARIA

Chlorosis, Davis, Missouri, 1929.

SPIRAEA DOUGLASSII

Virus disease, Zeller, Oregon, 1931, Same as on *Holodiscus discolor*.

RUTACEAE**CITRUS sp.**

NOTE: Atanasoff (1935) said that mal seco is same as Tarbut's infectious chlorosis.

NOTE: Bitancourt (1935) of Brazil believes psorosis, leprosis, ring blotch and zonate chlorosis due to viruses.

SALICACEAE

POPULUS BALSAMIFERA

Mosaic, Atanasoff, Bulgaria, 1934.

SANTALACEAE

SANTALUM ALBUM

Spike disease, Butler (1903) suggested that this disease was due to a virus. Rao & Gopola Iyengar (1934) reported two strains, rosette or old type and pendulous or new type. K. M. Smith (1935) says that this disease was first reported from Coorg, India, in 1899.

Leaf curl mosaic, Vankata Rao, 1933.

SAPINDACEAE

ACER NEGUNDO

Periclinal variegations, Funaoka, 1924.

Mosaic, Atanasoff, Bulgaria, 1935.

DODONAEA VISCOSA

Spike of Sandal, Suggested by Lushington, India, 1918. Also mentioned by Iyengar 1935.

SCROPHULARIACEAE

MIMULUS sp.

New disease of tomato, K. M. Smith, England, 1935.

SOLANACEAE

ATROPA BELLADONNA

Crinkle, Quanjer, Holland, 1923, I from tobacco.

Virescence (teratology), Ryjkoff, Ukaraine, 1934.

Stolbur, Koratshevsky, Russia, 1935.

BROWALLIA MAJOR

Spotted wilt of tomato, Ogilvie, England, 1935.

BROWALLIA SPECIOSA MAJOR

Spotted wilt of tomato, Ogilvie, England, 1932.

CAPSICUM sp.

Yellow mosaic of tomato, Stover & Vermillion, Ohio, 1932, N.

CAPSICUM ANNUUM

Mosaic, Lewis, Georgia, 1919, N.

Curly top of sugar beet, Severin, California, 1927, N.

Potato mosaic, J. Henderson Smith, England, 1928. I from *L. esculentum*.

Infectious chlorosis, Ikeno, Japan, 1930.

Psyllid yellows, 1930. Not proved to be a virus.

Mosaic, Johnson No. 1. Ainsworth, England, 1933.

Leafroll, Dykstra, 1933, I from potato by *M. Persicae*.

Glasshouse streak (identical with tobacco mosaic), Ainsworth, England, 1933.

Yellow mosaic, Stover & Vermillion, Ohio, 1933, I from tomato.

Curly top of sugar beet, Dana, Oregon, 1934. Slight symptoms.

Potato calico, Porter, California, 1935.

Bunchy top of tomato, McClean, South Africa, 1935. Transmissible by inoculation but not readily.

Bigarrure of potato, Verplancke, Belgium, 1935.

CAPSICUM GROSSUM

Celery virus 1, Wellman, Florida, 1934, I.

CESTRUM PARQUI

Virus disease, Trotter, Italy, 1935.

DATURA sp.

Virescens (teratology), Ryjkoff, Ukraïne, 1934.

DATURA STRAMONIUM

Virus disease, Verplancke, Belgium, 1930, Transmitted from *Araceae*.

Coarse etch, Johnson, Kentucky, 1930, I from tobacco.

Virus disease, Moore, South Africa, 1932, I. May be same as spotted wilt of tomato. Attacks *N. physaloides*, and *Physalis* sp.

Yellows, Verplancke, Belgium, 1932, I.

Spotted wilt of tomato, K. M. Smith, England, 1932.

Interveneal mosaic of potato, Clinch, Ireland, 1933, I.

Simple mosaic of potato, Clinch, Ireland, 1933, I.

Virus A of potato, Clinch, Ireland, 1933.

Streak of potato, Clinch, Ireland, 1933.

Leafroll of tomato, Dykstra, 1933, I from tomato by *M. persicae*.

Necrotic virus disease. Same as on potatoes.

Necrotic, Schultz & Raleigh, 1933. I from British Queen potato.

Mosaic of beet, Verplancke, Belgium, 1934.

Latent virus of potato, Jones & Burnett, Washington, 1934.

Yellow mosaic of cucumber, Ainsworth, England, 1934.

Potato calico, Porter, California, 1935.

New tomato disease, K. M. Smith, England, 1935.

Necrotic disease of tobacco, K. M. Smith & Bald, England, 1935.

Streak from tomato, K. M. Smith, England, 1935. I from tomato.

Yellow variation of same.

Stolbur, Koratshevsky, Russia, 1935.

Bigarrure of potato, Verplancke, Belgium, 1935.

DATURA TATULA

Bigarrure of potato, Verplancke, Belgium, 1935.

HYOSCYAMUS sp.

Yellows or mosaic, Allard, D. C. 1912, I from tobacco.

HYOSCYAMUS NIGER

Crinkle, Holland, 1923, I from *S. tuberosum*.

Virus Y potato, K. M. Smith, England, 1931, I from *S. tuberosum*.

Latent virus of potato, Jones & Burnett, Washington, 1934.

Mosaic of tobacco, Jones & Burnett, Washington, 1934.

Yellow mosaic of cucumber, Ainsworth, England, 1934.

Mosaic of beet, Verplaneke, Belgium, 1934.

Yellows of beet, Verplaneke, Belgium, 1934.

Streak of tomato, K. M. Smith, England, 1935, I from tomato.

Bigarrure of potato, Verplaneke, Belgium, 1935.

LYCOPERSICON ESCULENTUM

Yellows, western yellows, yellow blight etc, R. E. Smith, California, 1906, N. It was reported as due to the virus of curly top of sugar beet by McKay & Dykstra in 1927.

Filiform leaf, C. R. Orton, Pennsylvania, 1918, N. Known much earlier.

Fern leaf, Mogendorff, 1930, Known much earlier. Caused by cucumber virus 1.

Streak which has been reported as due to a combination of tobacco and potato mosaic viruses. Vanderpool published a paper (1926) in which he reported that the disease was due to a mixture of potato and tomato mosaic viruses. In a marginal note on a reprint sent to the compiler he says it was shown to be a latent potato mosaic virus. Jarrett, England, 1930 reported a streak due to a single virus. Valteau & Johnson, Kentucky, 1930 reported streak caused by (1) mixed viruses belonging to the true tobacco mosaic virus group, (2) three strains of true tobacco mosaic viruses plus the healthy potato virus, (3) three strains of cucumber mosaic viruses plus the healthy potato virus and (4) three strains of etch virus plus the healthy potato virus.

Leaf curl, Stephanoff. Astrakhan, 1930.

Streak or die back, Shapovalow, California, 1933. Different from the combination virus streak.

Mosaic, Fernow, New York, 1923, I from tobacco. I (1925) from *N. glutinosum*. Potato mosaic, 1923. Mosaic from Apparently healthy potatoes by Fernow, 1925.

Rugose mosaic, Burnett & Jones. Washington, 1931, I from potato.

Mosaic (Johnson's virus No. 1) Ainsworth, England, 1933.

Yellow mosaic of cucumber, Hoggan, Wisconsin, 1935. I from cucumber.

Yellow mosaic of tomato, Stover & Vermillion, Ohio, 1933, I.

Celery mosaic, Doolittle, Florida, 1931. Probably same as cucumber mosaic.

Spot necrosis, Burnett & Jones, Washington, 1931. Is caused by veinbanding and potato latent virus. Same as rugose mosaic of potato.

Latent virus, Burnett & Jones, Washington, 1931. I from potato.

Crinkle, Burnett & Jones, Washington, 1931. I from potato.

Leafroll, Burnett & Jones, Washington, 1931, I from potato.

Spindle tuber, Burnett & Jones, Washington, 1931, I from potato.

Delphinium virus, Valleau, Kentucky, 1932, I.

Veinbanding, Burnett & Jones, Washington, 1931. I from potato. Symptoms similar to symptoms described by Schultz as crinkle in 1929. Dykstra consider it a component of tomato mosaic.

Yellow spots, Jensen, New Jersey, 1933.

Big bud, Samuel, Bald & Eardly, Australia, 1933. Probably same as a disease reported by Cobb in 1902. Also known as bunchy top but not the same as the bunchy top of South Africa.

New virus disease, K. M. Smith, England, 1935. Also attacks *N. tabacum*, *N. glutinosum*, *N. langsdorffii*, *Datura stramonium*, *S. tuberosum*, (Arran Victory), *Vigna sinensis*, *Mimulus* sp. *Aster* sp. and *Zinnia* sp.

Streak (green), K. M. Smith, England, 1935. Same as tomato stripe of Ainsworth et al, 1934. When this virus was grown on white Burly tobacco, a yellow strain appeared.

Necrotic virus disease of tobacco, K. M. Smith & Bald, England, 1935.

New virus disease of tomato and *V. sinensis*, K. M. Smith, England, 1935.

Virus diseases 1, 2, 3, K. M. Smith, England, 1935, N.

Virus disease, Moore, South Africa, 1932, May be same as spotted wilt.

Virescence (teratology), Ryjkoff, Ukraïne, 1933. Also on *N. tabacum*, *Convolvulus arvensis*, *Atropa belladonna* and *Datura* spp.

NOTE: Bunchy top of Australia is different from bunchy top of South Africa. See big bud.

Necrosis, Schultz & Raleigh. I from British Queen.

Leafroll, 1923, I from tomato and *D. tatula* by *M. persicae*.

Calico of potato, Porter, California, 1935.

Huissen, Van Schreven, Holland, 1935.

Stolbur, Koratskevsky, Russia, 1935. This disease also attacks *Atropa belladonna*, *Datura stramonium*, *Nicotina tabacum* and *Convolvulus arvensis*. Same as fruit woodiness.

NOTE: A new tomato disease reported by K. M. Smith, June 1935 was proved later by Ainsworth to be due to ordinary tomato virus.

CURRENT TOMATO—Latin name not given.

Bunchy top of tomato, McClean, South Africa, 1935, I.

NICANDRA PHYSALOIDES

- Mosaic (potato and tobacco), Fernow, New York, 1923.
- Mosaic from apparently healthy potato, Fernow, New York, 1925.
- Mosaic from *N. tabacum*, *N. glutinosum*, *N. rustica*, *D. str-*
and L. esculentum.
- Crinkle of potato, Clinch, Ireland, 1933. I.
- Interveinal mosaic of potato, Clinch, Ireland, 1933, I.
- Bunchy top of tomato, McClean, South Africa, 1935, I.
- Latent virus of potato, Jones & Burnett, Washington, 1935.
- Tobacco mosaic, Jones & Burnett, Washington, 1935.
- Bigarrure of potato, Verplancke, Belgium, 1935.

NICOTIANA (many species)

- Spotted wilt of tomato, Ogilvie, England, 1935. Also by K. M. Smith.

NICOTIANA ACUMINATA

- Curly top of sugar beet, Freitag & Severin, California, 1933,
I from sugar beet by *E. tenellus*.

NICOTIANA BIGELOVII (*N. multivalis* & *N. quadrivalis* are considered as varieties.)

- Tobacco mosaic, Holmes, New Jersey, 1934.

NICOTIANA CLEVELANDI

- Tobacco mosaic, Holmes, New York, 1932.

NICOTIANA FORTGETIANA

- Mosaic, Allard, D. C. 1914.

NICOTIANA GLAUCA

- Mild yellow mosaic, McKinney, D. C. 1931. Does not attack
L. esculentum.
- Severe yellow mosaic, McKinney, D. C. 1931. Attacks *L. escu-*
lentum and *N. tabacum*.
- Yellow mosaic, (mild, intense or medium), McKinney, D. C.
1931.
- Hy III, Hamilton, England, 1932, I.
- Tobacco mosaic, Jones & Burnett, Washington, 1935.

NICOTIANA GLUTINOSA

- Glass house streak (identical with tobacco mosaic), Ains-
worth, England, 1933.
- Mild cucumber mosaic, Hoggan, Wisconsin, 1935. I from
cucumber.
- New tomato disease, K. M. Smith, England, 1935. I.
- Necrotic virus disease of tobacco, K. Smith & Bald, England,
1935. I.
- Streak of tomato (& yellow strain of same), K. M. Smith &
Bald, England, 1935. I.
- Mosaic (same as on *Cheiranthus cheiri*), K. M. Smith, England,
1935. N.

Mosaic, Fernow, New York, 1925, I from apparently healthy potato.

Latent virus of potato, K. M. Smith, England, 1935. Also attacks, *N. tabacum*.

Johnson's tobacco virus No. 1. Stanley, New Jersey, 1936.

NICOTIANA LANGSDORFII

Tobacco mosaic, Holmes, New Jersey, 1932. I from tobacco.

New tomato disease, K. M. Smith, England, 1935.

Tomato streak, K. M. Smith, England, 1935.

Johnson's tobacco virus No. 1. Stanley, New Jersey, 1936.

NICOTIANA LONGIFLORA

Tobacco mosaic, Jones & Burnett, Washington, 1935. I.

NICOTIANA MACROPHILLA

Mosaic, Johnson's virus No. 1. Ainsworth, England, 1933.

NICOTIANA MICRANTHA

Mosaic of beet, Verplancke, Belgium, 1933.

NICOTIANA MULTIVALIS var. of *N. bigelovii*

Tobacco mosaic, Holmes, New York, 1932.

NICOTIANA PALMERI

Tobacco mosaic, Jones & Burnett, Washington, 1935.

NICOTIANA PANICULATA

Tobacco mosaic, Jones & Burnett, Washington, 1935.

NICOTIANA RUSBYI

Tobacco mosaic, Jones & Burnett, Washington, 1935.

NICOTIANA RUSTICA

Latent virus of potato, Jones & Burnett, Washington, 1935.

Bigarrure of potato, Verplancke, Belgium, 1935.

NICOTIANA SUAVEOLENS

Tobacco mosaic, Jones & Burnett, Washington, 1935.

NICOTIANA SYLVESTRIS

Rotterdam B, Jochems, Sumatra, 1928, I.

Yellow mosaic, Jensen, New Jersey, 1933.

NICOTIANA TABACUM

Common mosaic, Woods, U. S. 1899.

Mottle, James Johnson, Wisconsin. I with juice from apparently healthy potato. He reported two viruses, one producing mottle and the other same as virus B.

Speckled mosaic of tobacco, James Johnson, Wisconsin, 1926.

NOTE: Up to 1926 it was supposed that tobacco, tomato and other Solanaceae (not including potato) were attacked by a single mosaic. James Johnson showed that there were five, tobacco mosaic, cucumber mosaic, petunia mosaic, speckled mosaic of tobacco and mild mosaic of tobacco.

Cucumber mosaic (three types), Valleau & Johnson, Kentucky, I from tobacco, melons and milkweed.

- Vein margin, Valleau & Johnson, Kentucky, 1928, N. I from tobacco.
- Latent virus, Johnson, Kentucky, 1930, I from apparently healthy potatoes.
- White & green ring spot, Johnson, Kentucky, 1930.
- Spot necrosis, Valleau & Johnson, Kentucky, 1930. I with mosaic virus from Irish potato. I from rugose mosaic of Green Mountain potatoes. I from interveinal of Irish Cobbler potatoes. I with mixture of veinbanding virus and potato virus.
- Crinkel A of potato, Salaman, England, 1930, I from potato.
- Neerfstreep (vein streak), Jochems, Sumatra, 1930. N.
- Ring mosaic, Johnson, Kentucky, 1930. N.
- Spotted wilt of tomato, Samuel, Bald & Pittman, Australia, 1930. I from tomato. They observe similar symptoms on *Solanum niger* and *Physalis peruviana*.
- Curl or stripe, Böning, Germany, 1931.
- Mosaic, van der Meer, Holland, 1931. I from apparently healthy Green Mountain potatoes.
- Ring spot type, Henderson, Virginia, 1931. I from sweet clover.
- Yellow ring spot, Valleau, Kentucky, 1932. Transmitted by seeds.
- Kroepoek, Thung, Java, 1932. Probably same as faltenzerg of Peters & Schwarze (1912), kroepoek and krekoh of Kenchonijs (1915) and Gandrup (1924), gila of Jochems (1926), crinkel of Roberts (1930) and crinkel dwarf of Storey (1931). He divided it into (1) common kroepoek, (2) curl and (3) transparent kroepoek.
- Streak of potato, Schaffnitt & Muller, Germany, 1931, I from potato.
- Yellow spot, Jensen, New Jersey, 1933.
- Simple mosaic of potato, Clinch, Ireland, 1933. I.
- Virus A of potato, Clinch, Ireland, 1933.
- Interveinal mosaic of potato, Clinch, Ireland, 1933. I.
- Yellow mosaic of tomato, Stover & Vermillion, Ohio, 1933. I. Jensen of New Jersey reported several strains.
- Curly top of sugar beet, Dana, Oregon, N. Bennett of California by inoculation same year.
- Virescence (teratology), Ryjkoff, Ukraïne, 1934.
- Yellow mosaic of cucumber, Ainsworth, England, 1934.
- Krul (curl) and kroepoek (crinkle), Thung, Java, 1934. Attacks *Ageratum conyzoides*, *Synedrella nodiflora* and *Vernonia cinerea*. Probably transmitted by *Bemisia* sp.
- New tomato disease, K. M. Smith, England, 1935.
- Necrotic virus disease, K. M. Smith & Bald, England, 1935.
- Tomato streak (on white burley), K. M. Smith, England, 1935. Also a yellow strain obtained from white burley.
- Bunchy top of tomato, McClean, South Africa, 1935. By grafting.

Mosaic (same as on *Cheiranthus cheiri*), K. M. Smith, England, 1935.

New virus disease, K. M. Smith, 1935. Occasionally attacks *N. glutinosa*.

Mosaic of sugar beet, Verplancke, Belgium, 1934.

Bigarrure of potato, Verplancke, Belgium, 1935.

Stolbur, Koratshevsky, Russia, 1935.

Streak, J. Johnson, Wisconsin, 1936. This disease is due to rather rare, distinct, sensitive virus.

Yellow mosaic of tobacco, Jensen, New Jersey, 1936. He reported 51 strains derived from common tobacco mosaic.

New disease (probably virus) in Mauritius. Shepherd. 1936. Very similar to kroepock disease in Java and the leaf curl or crinkle dwarf in Africa.

NOTE: A virus disease of tobacco transmitted by *Thrips tabaci* was reported from South Africa by Moore in 1932. K. M. Smith (1933) suggested that this disease may be due to the same virus as the yellow spot of the pineapple in Hawaii and the spotted wilt of tomato.

NICOTIANA TRICONOPHYLLA

Tobacco mosaic, Jones & Burnett, Washington, 1935.

NICOTIANA TRIPLEX

Mosaic, Kostoff, Russia, 1933.

PETUNIA sp.

Mosaic, Johnson's No. 1, Ainsworth, England, 1933.

Interveneal mosaic of potato, Clinch, Ireland, 1933, I.

Potato calico, Porter, California, 1935.

Streak of tomato, K. M. Smith, England, 1935. I.

PETUNIA HYBRIDA

Veinbanding component of rugose mosaic of tomato. Dykstra, 1933, I by Aphis.

Bunchy top of tomato, McClean, South Africa, 1935. I.

Bigarrure of potato, Verplancke, Belgium, 1935.

PETUNIA NYCTAGINIFOLIA

X virus of potato, Bohme, Germany, 1933. I.

Bigarrure of potato, Verplancke, Belgium, 1935.

PHYSALIS sp.

Mosaic and cucumber mosaic are intertransmissible according to Walker. 1924.

Cucumber mosaic (type 1) Johnson, Kentucky, 1930.

Virus disease, Moore, South Africa, 1932. May be same as spotted wilt.

PHYSALIS ALKENKEGI

Tobacco mosaic, Hoggan, Wisconsin, Gives mottling symptoms.

Previously supposed to be a symptomless carrier.

Mosaic of beet, Verplancke, Belgium, 1934.

Yellows of beet, Verplancke, Belgium, 1934.

Bigarrure of beet, Verplancke, Belgium, 1935.

PHYSALIS ANGULATA

Bunchy top of tomato, South Africa, I. 1935.

PHYSALIS FRANCHETTI

Common tobacco mosaic, Hoggan, Wisconsin, 1927.

PHYSALIS PERUVIANA

Mosaic, Crawford, Iowa, 1921. N.

Bunchy top of tomato, McClean, South Africa, 1935, I.

PHYSALIS PUBESCENS

Cucumber mosaic (three types), Johnson, Kentucky, 1930, I.

Glass house streak. Identical with tobacco mosaic, Ainsworth, England, 1933.

PHYSALIS VISCOSA

Bunchy top of tomato, McClean, South Africa, 1935, I.

PHYSOCHLAENA ORIENTALIS

Mosaic of beet, Verplancke, Belgium, 1934.

Yellows of beet, Verplancke, Belgium, 1934.

SALPIGLOSIS sp.

Spotted wilt of tomato, K. M. Smith, England, 1935, N.

SCHIZANTHUS sp.

Spotted wilt of tomato, K. M. Smith, England, 1935, N.

SOLANUM ACULEASTRUM

Bunchy top of tomato, McClean, South Africa, 1935, I. One case only.

SOLANUM ACULEATISSIMUM

Bunchy top of tomato, McClean, South Africa, I. 1935.

SOLANUM ALIATUM

Bunchy top of tomato, McClean, South Africa, 1935, I.

SOLANUM CABILIENSE

Tobacco mosaic, Hoggan, Wisconsin, 1927.

SOLANUM CALCASHII

Leaf roll, Ducomet, France, 1921, N. Same as on potato.

Curly leaf, Ducomet, France, 1921, N. Same as on potato.

SOLANUM CAPSICASTRUM

Bigarrure, Verplancke, Belgium, 1935.

SOLANUM CILIATUM

Glass house streak, Identical with tobacco mosaic, Ainsworth, England, 1933.

Mosaic (Johnson's No. 1), Ainsworth, England, 1933.

SOLANUM DULCAMARA

Simple mosaic of potato, Clinch, Ireland, 1933, I.

Crinkle of potato, Clinch, Ireland, 1933, I.

Latent virus of potato, Jones & Burnett, Washington, 1935.

SOLANUM DUPLOSINUATUM

Bunchy top of tomato, McClean, South Africa, 1935. One case by inoculation and one case by grafting.

SOLANUM HUMILE

Krausel mosaic (or tomato mosaic), Schaffnitt & Muller, Germany, 1931, I from *L. esculentum* and *S. integrifolium*.

Streak necrosis of tobacco, Schaffnitt & Muller, Germany, 1931, I from *S. tuberosum*.

SOLANUM INCANUM

Bunchy top of tomato, McClean, South Africa, I, 1935.

SOLANUM LYCOPERSICUM

Bigarrure of potato, Verplancke, Belgium, 1935.

SOLANUM MARGINATUM

Tobacco mosaic, Hoggan, Wisconsin, 1927.

SOLANUM MELONGENA

Mosaic which attacks *Hibiscus esculentum*, Park, Ceylon, 1929.

Veinbanding, Johnson, Kentucky, 1930. I.

Healthy potato virus, Johnson, Kentucky, 1930, I.

Cucumber mosaic (three types), Johnson, Kentucky, 1930. I.

Tomato mosaic, Ramsey, Minnesota, 1922.

Crinkle of potato, Clinch, Ireland, 1933, I.

Mosaic (Johnson's Virus No. 1), Ainsworth, England, 1933.

Curly top of sugar beet, Oregon, 1934, N.

Potato calico, Porter, California, 1935.

Bunchy top of tomato, McClean, South Africa, 1935, I.

Yellow mosaic of cucumber, Hoggan, Wisconsin, 1935, I from cucumber.

SOLANUM NIGRUM

Y virus of potato, K. M. Smith, England, 1931, I from potato.

Yellow mosaic of tomato, Stover & Vermillion, Ohio, 1933, I from tomato.

Latent virus of potato, Jones & Burnett, Washington, 1934.

Yellow variant of tomato streak, K. M. Smith, 1935.

Bunchy top of tomato, McClean, South Africa, 1935, I.

Yellow mosaic of cucumber, Hoggan, Wisconsin, 1935, I from cucumber.

Bigarrure of potato, Verplancke, Belgium, 1935.

SOLANUM PANDURAEFORME

Bunchy top of tomato, McClean, South Africa, 1935. I. One case.

SOLANUM PYRACANTHUM

Tobacco mosaic, Hoggan, Wisconsin, 1927, I. Some authors referred to this as a symptomless carrier.

SOLANUM SODOMACEUM

Bunchy top of tomato, McClean, South Africa, 1935. I. One case.

SOLANUM TUBEROSUM

- Curl, Maxwell, England, 1757. This appears to be the first record of a virus disease of potatoes but we do not know to what disease it refer. This disease was known on the continent and there may be other records that antedate this one.
- Mosaic, Allard, D. C. 1912. I from *N. tabacum*. I from *L. esculentum* and *S. tuberosum* by Fernow in 1925 and from *C. sativus* by Doolittle & Walker in 1932.
- Crinkle mosaic, Schultz & Folsom, Maine, 1925. Later studies have shown that this is not the same as the crinkle of Europe.
- Mosaic ex, Clinch, 1933 Ireland. Same as reported by Salaman in 1930 as reduced crinkle.
- Mosaic ex C, Clinch & Loughnane, Ireland, 1933. Corresponds to simple mosaic.
- Interveinal mosaic, Quanjer, Holland, 1923. I.
- Aeneba mosaic, Quanjer, Holland, 1923. I.
- Rugose mosaic, Gardner, Kentucky, 1923. Observed. Again by Valleau & Johnson, Kentucky, 1930. They believed it to be the same as spot necrosis of tobacco. It was apparently caused by a combination of a healthy potato virus and veinbanding virus. Koek of Wisconsin, 1930 said it was due to a mottle virus (normally present in apparently healthy potatoes) and veinbanding virus.
- Super mild mosaic, Jones, Anderson & Burnett, Washington, 1934.
- Foliar necrosis (virus D), Bawden, England, 1934. N.
- Simple mosaic, Clinch, Ireland, 1933, N. She says that this was reported by Murphy & McKay (1931 & 32) but the publications are not available for the compiler.
- Mild mosaic, Schultz & Bonde, Maine, 1934. Due to two components, a latent virus of the Green Mountains and some other varieties plus a virus causing light green and slightly rugose leaves.
- Streak, Orton, U. S. 1912, N. Quanjer & Oortwijn, Holland, 1930, reported four types—Stipple streak of Atanasoff, Stipple streak in May Queen, Stipple streak in Noordling and stipple streak disease.
- Streak from tomato (Arran variety), K. M. Smith & Bald, England, 1933.
- Stipple streak, Quanjer, Holland, 1923. N. He believes it to be the same as streak reported by Orton from U. S. Atanasoff reported a stipple streak from Holland, 1925, which he regarded as an intensified form of mosaic.

NOTE: Stipple streak or leaf drop of Orton may be same as Acropetal mosaic, or it may be a reaction in some varieties to K. M. Smith's virus Y, according to Salaman & Bawden, 1932.

Net necrosis, first described by Orton in 1914. Schultz & Folsom (1923) believed that it was a symptom of leaf-roll. Gilbert (1923) believed that it was associated with spindle sprout and

leaf roll. Atanasoff (1926) said that it was a distinct disease and that the leaf symptoms varied according to Quanjer's aucuba (1923) mosaic. Schultz & Folsom, Maine, (1920) produced the disease by inoculation and by graft form apparently healthy potatoes.

NOTE: Atanasoff (1926) said: "Net necrosis is a tuber symptom not of leaf roll, but of aucuba mosaic. Spindle sprout, supposed by some to develop on those potato tubers affected with leaf roll and with net necrosis, has no relation to leafroll."

Acropetal necrosis, pseudonet necrosis and concentric necrosis, Quanjer, Holland, 1931.

Acronecrosis (top-necrosis internal, acropetal necropetal necrosis (leaf drop streak) & phloem necrosis (leaf roll) Bawden, England, 1932.

Top necrosis, Oortwijn & Quanjer, Holland, 1930. Four types as follows,—Yellow dwarf of Barrus & Chupp, top necrosis latent in Green Mountains, top necrosis latent in Duke of York, top necrosis latent in Monocrat and some strains of Red Star.

Top necrosis is same as Quanjer's acronecrosis according to Salaman & Bawden, England, 1932. It is divisible into—(1) top necrosis X due to X virus, (2) top necrosis A due to a complex of X & Y viruses and possibly associated with Z virus, (3) top necrosis B due to complex of Z & Y viruses and (4) top necrosis C due to X & Y viruses and containing necrotic and mosaic symptoms.

Necrosis (on British Queen), Schultz & Raleigh, California, 1933. Inoculated into tobacco, tomato and *D. stramonium*.

Necrotic virus disease, Schultz & Raleigh, California, 1933. N. First found in California in 1929. Has been transmitted to *D. stramonium*.

Necrotic disease of tobacco, K. M. Smith & Bald, England, 1935, I. A letter from Schultz says that necrosis is a symptom of leaf-roll.

Crinkle, K. M. Smith, England, 1930, Due to X and Y viruses. The needle transmits both viruses but *Myzus persicae* transmits Y only. K. M. Smith says that these viruses belong to the crinkle mosaic group.

Crinkle A, Salaman, Redcliff & LePelly, England, 1930, N.

Crinkle, Clinch, Ireland, 1935. She says that this is the same as Murphy's Canadian crinkle (1921), Quanjer (1923) and Salaman (1923) as reduced crinkle.

NOTE: Crinkle is same as frisolet and caused by Z & Y viruses according to K. M. Smith & Dufrenoy, 1934.

Leaf drop mosaic, Murphy, Ireland, 1923. I.
Spindle tuber, Folsom, Maine, 1924.

Latent virus, J. Henderson Smith, England, 1928. He said this virus was known in England as Y and in America as veinbanding.

Top-necrosis = Acronecrosis. Salaman and Bawden. England. 1932.

NOTE: Salaman (1932) said—

“The Z virus acting alone has a very limited pathogenicity but acting in unison with either X or Y or both, it brings about the disease known as crinkle A and para crinkle.

“When certain virus elements X, Y, or Z are brought together experimentally in appropriate groupings, it has proved possible to build up such clinical pictures as Interveinal Mosaic, Crinkle A, and para-crinkle, i. e., virus complexes have been synthesized in the potato.”

Kringerigheid, Klebahn, Holland, 1930, N. Similar to pseudonet necrosis. Occurs on certain soils.

Veinbanding virus, Valleau & Johnson, Kentucky, 1930. Same as on tobacco.

Interveinal mosaic, K. M. Smith, England. 1930.

Virulent virus, Burnett & Jones, Washington, 1931. Attacks tomato.

Ring spot of tobacco, Henderson, Virginia, 1931. I.

Spotted wilt of tomato, K. M. Smith, England, 1932.

Potato ring spot virus, Koeck, Wisconsin, 1933. May have almost the same effect as mottle virus.

Veinbanding component of tomato rugose. Dykstra, 1933. I by aphids.

California aster yellows, Severin & Haasis, 1934, California, I by *C. divisa*.

Bunchy top of tomato, McClean, South Africa, I. Difficult to transmit.

Psyllid yellows, Richardson, Utah, 1927. N. Has the appearance of a virus disease but the evidence indicates that it is due to *Paratriozoa cockerelli*.

Bigarrure or mosaic streak, Verplancke, Belgium, 1935.

Concentric necrosis, Roshalin, Russia, N. 1935. Appears to be due to soil.

Latent virus potato, Jones & Burnett, Washington, 1935. I.

Latent virus of potato, Chester, New Jersey, 1935. Includes many strains.

NOTE: Dykstra (1936) published a paper on comparative studies on European and American potato viruses. He said—

The X virus of Europe is similar to the so-called latent virus of America.

The Y virus and vein-banding virus (rugose mosaic without the X component) belong to the same group but are not identical.

Paracrinkle of Europe does not resemble leaf-rolling mosaic or any other American potato virus.

Crinkle A of Europe is not identical with rugose mosaic of America.

Virus C of Europe does not resemble any known virus of potatoes in America.

NOTE: M. A. Watson writes (May 11, 1936) to the compiler as follows: Dr. Kenneth M. Smith's remarks apply only to Hy. II and Hy. IV, which he regards as strains of Potato mosaic. Hy. III is an entirely different virus and does not go into potato at all. Hy. IV may be the same as Potato virus X but neither of these viruses is transmitted by *M. persicae*."

NOTE: Jones, Anderson & Burnett (1934) reported that all commercial American potatoes contained symptomless viruses. Three that have been definitely recognized are known as mottle, ring spot and spot necrosis.

NOTE: K. M. Smith (1935) says that the X virus of England is same as the "healthy potato virus" of the United States.

NOTE: "Wilding" of potatoes appears to be the same as witches' broom.

Folsom & Bonde of Maine published a list of 26 viruses in 1936. They are as follows:

- "(1) Tobacco mottle and/or ringspot of J. Johnson. Usually found together. Masked in most potato varieties. Synonyms: potato mottle and potato ringspot of Koch and Johnson; seedling streak; latent virus; healthy-potato virus; X virus; B virus of Fernow; simple mosaic; acroncrosis or top-necrosis. Probably several closely related viruses are involved.
- "(2) Tobacco ringspot of Virginia. Results in local infection of potato but is entirely distinct from the healthy-potato virus.
- "(3) Tobacco mosaic. May be only partially systemic in potato plants of some varieties.
- "(4) Cucumber mosaic.
- "(5) Green Mountain rugose mosaic. Viruses: pure rugose mosaic and latent. Synonyms: veindbanding and mottle or ringspot, in combination.
- "(6) Green Mountain mild mosaic. Viruses: pure mild mosaic and latent.
- "(7) Green Mountain crinkle mosaic. Viruses: probably pure crinkle mosaic and latent.
- "(8) Green Mountain leaf-rolling mosaic. Viruses: probably pure leaf-rolling mosaic and latent.
- "(9) Green Mountain interveinal mosaic. Viruses: probably pure interveinal mosaic and latent.
- "(10) Aucuba mosaic.
- "(11) Calico of Porter.
- "(12) Green Mountain streak. Viruses: Possible Y of Smith and latent.
- "(13) Streak of Koch and Johnson.
- "(14) Tomato spotted wilt.
- "(15) Bigarrure of Verplancke.
- "(16) Leaf roll.
- "(17) Apical leaf roll of Schultz & Bonde. Synonym: probably yellow top of Folsom (oral conclusion, Schultz to Folsom).
- "(18) Witches' broom. Synonym: wilding.

- “(19) Yellow dwarf.
- “(20) Aster yellows.
- “(21) Beet curly top.
- “(22) Spindler tuber.
- “(23) Unmottled curly dwarf.
- “(24) Transmissible low-growing habit of M’Intosh.
- “(25) Pseudonet necrosis.
- “(26) Internal spotting in tubers (excluding some non-virotic kinds.
- “Green Mountain mottled curly dwarf is a mixture of leaf-rolling mosaic and spindle tuber. In general however, curly dwarf is a mixture whose composition has been rather indefinite. The same is true of mosaic dwarf, leaf curl, and stipple streak.
- “Of tobacco spot necrosis, crinkle, paracrinkle, Up-to-Date streak, acropetal necrosis, A of Ireland, and B, C, D, and Z of England, each probably, or at least possibly, is the same as one of the list above, or a mixture of some of those listed above.
- “Marginal leaf roll and giant hill possibly are not viroses.”

SOLANUM PYRACANTHUM

Mosaic, Hoggan, Wisconsin, 1927.

SOLANUM VILLOSUM

Rugose mosaic of Dykstra, 1933. 1 from potato.

Leaf roll, Dykstra, 1923. 1 from potato and *Datura tatula* by *Myzus persicae*.

Veinbanding component of tomato rugose mosaic, Dykstra, 1 by aphids.

ULMACEAE

ULMUS sp.

Mosaic, Atanasoff, Bulgaria, 1935.

UMBELLIFEREAE

APIUM GRAVEOLENS

Aster or carrot yellows obtained from all states except California. Severin & Haasis (1934) reported that this host was susceptible to all strains.

APIUM GRAVEOLENS CELERIAC

Celery yellows.

APIUM GRAVEOLENS RAPECEUM

NOTE: Kunkel (1932) reported that the celery yellows of California could not be distinguished from Aster yellows in New York. It is transmissible by *C. seznottata*.

DAUCUS CAROTA var. *sativa*.

Tobacco mosaic, Jones & Burnett, Washington, 1935.

LIGUSTRUM VULGARE

Chlorosis, Baur, Germany.

VERBENIACEAE

LANTANA sp.

Sandal spike, suspected for many year. Confirmed by Vraradaraja Iyengar & Rangaswami, India, 1935. In manuscript.

CHLORODENDRON FRAGANS

Mosaic, Blattny, 1924, N.

VERBENA URTICAIFOLIA

Mosaic, Curtis, Iowa, 1919, I.

VIOLACEAE

CULTIVATED PANSY

Curly top of beet, Dana, Oregon, 1934. N.

VIOLA sp. (Violet and pansy)

Cucumber virus 1, K. M. Smith, England, 1936.

VIOLA ARVENSE TRICOLOR

Mosaic of beet, Verplancke, Belgium, 1932, I.

VIOLA PAPILIONACEAE

Ring spot of tobacco, Wingard, Virginia, 1929, I from tobacco.

VIOLA TRICOLOR

Ring spot of tobacco, Wingard, Virginia, 1928, I from tobacco.

Vein aucuba, Blattny, Czechoslovakia, 1930.

Virus disease, G. H. Martin, Jr., U. S., 1925.

ERRATA

TO HOST INDEX OF VIRUS DISEASE OF PLANTS

(Vol. XIX. No. 3, pp. 315-406, 1935)

Page 319, line 8—should read *Asclepis syriaca*.

Page 342, line 3.—Maderspatanus should read Maderaspatus.

Page 342, lines 16 and 18—An error. Omit. Ainsworth stated that cucumbers could not be infected.

Page 362, line 13—should read *Lilium auratum*.

Page 385, line 4—should read Potato yellow mosaic, Henderson Smith, England, 1928, N.

Page 386, line 13.—Ainsworth should read Ainsworth.

Page 387, line 22—should read *Nicotiana acuminata*.

Page 388, line 1—should read *tabacum*.

FIRST SUPPLEMENT TO THE INDEX OF VECTORS OF VIRUS DISEASES OF PLANTS *

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This supplement is submitted to the workers on virus diseases of plants hoping that it may be useful in the advancement of this branch of science which is a combination of plant pathology and entomology. It makes the original index fairly complete. About twenty five genera and more than sixty five species of insects are added to the original list. Many new records of transmission are also added to the list.

AMPHOROPHORA ROSSI

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

AMPHOROPHORA RUBI

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

AMPHOROPHORA RUBICOLA

1932. Bennett says this species is less important than *A. rubi*.

ANOECIA sp.

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

APHIS sp.

NOTE: A letter from Dr. Schultz states that he and Dr. Folsom obtained transmission of mild mosaic (1918), leaf roll (1919), spindle tuber (1922), rugose mosaic (1922), leaf rolling mosaic (1922), unmottled curly dwarf (1922) and streak (acropetal necrosis) (1924).

1925. Mosaic. *Physalis pubescens* to *Cucumis sativus*, Walker. U. S.

1925. Mosaic. *Physalis sativus*, *Lathyrus odoratus* and *Trifolium pratense* to *C. sativus* and *L. odoratus*. Doolittle & Jones. U. S.

1925. Mosaic. *Physalis pubescens* to *P. pubescens*. Walker.

APHIS AGERATOIDIS

1933. Yellow dwarf of onion. Onion to Onion. Drake, Tate & Harris. Iowa.

APHIS CARDUI

1933. Yellow dwarf of onion. Onion to Onion. Drake, Tate & Harris. Iowa.

* Journal of the Department of Agriculture of the University of Puerto Rico. 19(3): 407-420. July, 1935.

APHIS DECEPTA

1933. Yellow dwarf of onion. Onion to Onion. Drake, Tate & Harris. Iowa.

APHIS FABAE

1927. Mosaic. *Vicia faba* to *V. faba*. Böning, Germany.
 1929. Mosaic. *Phaseolus vulgaris* to *Vicia faba*. Elze. Holland. A record for 1927 was not positive.
 1930. Mosaic. Sugar beet to *Chenopodium album*, *Amaranthus* and *S. arvensis*. Novinenko. Ukranie.

APHIS FORBESI

1933. Yellow dwarf of onion. Onion to Onion. Drake, Tate & Harris. Iowa.
 1934. Mosaic of sugar beet to several plants. Verplancke. Belgium.

APHIS GOSSYPH

1914. Mosaic, *Lathyrus odoratus* to *L. odoratus*. Taubenhaus. Delaware.
 1925. Yellow flat mosaic. Easter lily to Eastern lily. Ogilvie. Bermuda.
 1925. Garden pea & sweet pea to garden pea & sweet pea. Doolittle & Jones. U. S. Note. Hoggan says that this is *Illinoia* sp.
 1925. Mosaic. Red clover to garden pea. Doolittle & Jones. U. S.
 1925. Mosaic. Cucurbits to cucurbits. Doolittle & Jones. U. S.
 1925. Mosaic. Easter lily to Easter lily. Gutermann. New York.
 1925. Mosaic. Cucumber to *Physalis pubescens*. Walker. U. S.
 1925. Mosaic. Celery to celery and cucumber. Elmer. Iowa.
 1933. Mosaic. Bean to bean. Zaumeyer. U. S.
 1933. A virus disease of *Lilium longiflorum* var. *formosum* and var. *erabu*. Also *L. auratum*. Pape. Germany.
 1935. Fern leaf of tomato. Jones & Burnett. Washington. Note. Same as cucumber mosaic.
 1934. Mosaic. Vegetable marrow (*Cucurbita*?) to Vegetable marrow. Gigante. Italy.

APHIS MAIDIS (A. ADUSTA)

1929. Storey, reported a strain of mosaic transmitted to maize and Sorghum but not to sugar cane.
 1923. Sugar cane mosaic. *Saccharum officinarum* to *Miscanthus sinensis*, *Syntherisma anguinale*, *Paspalum boscianum*, *Holcus sorghum*, *Brachiaria platyphylla*, *Chaetochloa lutescens*, *C. magna* and *Panicum dichotomiflorum*. Brandes & Klaphaak. U. S.
 1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

APHIS MEDICAGINIS

1936. Mosaic. Bean to bean. Zaumeyer & Kearns. U. S.

APHIS OENOTHERAE

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

APHIS POMI

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

APHIS RHAMNI

Said to carry a virus of *Cirsium* sp. and *S. tuberosum*. No data.

APHIS RUBIPHILA

1927. Curl. Raspberry to raspberry. Bennett, Michigan. May rarely carry mosaic.

APHIS RUMICIS

1931. Yellows. Spinach to spinach. Blattny. Czechoslovakia.

1934. Mosaic. *Vicia faba* to *V. faba*. Imai. Japan.

1935. Sore shin of *Lupinus angustifolius*. Broad bean to broad bean. Chamberlain. Australia.

APHIS SPIRAECOLA

1936. Mosaic. Bean to bean. Zaumeyer & Kearns. U. S.

APHIS VIBURNICOLA

1933. Yellow dwarf. Onion to onion. Drake, Tate & Harris. Iowa.

AULACORTHUM PELARGONII

1934. Mosaic of beet to several hosts. Verplancke. Belgium.

BEMISIA sp.

1932. Kroepoek of tobacco & *Zinnia elegans*. Kerling. Java.

BEMISIA FASCIALIS

1931. Leaf curl. Cotton to cotton. Kirkpatrick. Sudan.

BEMISIA GOSSYPIPERDA

1935. Azerbaijan. Cotton to cotton. Verderevsky. Russia.

BEMISIA NIGERNIENSIS

1934. Probably carries krul (curl) and kroepoek (crinkle) of tobacco. Thung. Java.

1935. Mosaic. Cassava to cassava. Golden. Southern Nigeria. Record not positive.

BREVICORYNE BRASSICAE

1933. Mosaic. Bean to bean. Zaumeyer.

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

CALOCORIS BIPUNCTATUS

1933. Virus A. Potato to potato. Loughnane. Ireland.

CALAPHIS BETULELLA

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

CAPITOPHORUS FLAVEOLUS

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

CAPITOPHORUS RIBIS

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

CHAITOPHORUS QUERCICOLA

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

CAPITOPHORUS VIMINALIS

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

CHLORITA FLAVECENS (*Empoasca*)

1928. Mosaic. Celery to celery Blattny. Czechoslovakia.

CHLORITA SOLANI

Mosaic. Beans to beans. No data.

CICADULA DIVISA

1934. California aster yellows. Aster to potato. Severin & Haasis. California.

CICADULA SEXNOTATA (*C. divisa*)

1924. Yellows. Aster to aster. Kunkle. New York.

1929. Celery yellows. Celery to celery. Severin. Calif. Same as aster yellows.

1930. Yellows. Carrot, parsley & parsnip to aster & celery. Severin. California. This virus is identical with California aster & celery yellows.

1930. Yellows. Aster & celery to parsley. Severin. California.

1932. California yellows. Aster to aster. Kunkel. New York.

1932. California yellows. Celery to aster. Kunkel. New York.

1932. California yellows. Carrot to aster. Kunkel. New York.

1932. Yellows. Carrot to aster & celery and back. Severin, California.

1932. Yellows. Celery to aster & celery and back. Severin, California.

NOTE: The last three are same as California aster yellows.

1932. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

CICADULINA ZEAE

1931. Streak. Corn to corn. Tanganyika. Storey.

CLAVIGERUS SALICIS

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

DIABROTICA DUODECIMPUNCTATA

1935. Fern leaf of tomato. Jones & Burnett. Washington.

DIABROTICA VITTATA

1935. Fern leaf of tomato. Jones & Burnett. Washington.
Same as cucumber virus.

DREPANAPHIS ACERIFOLIAE

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

DORALYS FABAE

1934. Mosaic. Beet to other hosts. Verplancke. Belgium.

EMPOASCA FABAE

1928. Yellow top of alfalfa. Appears to be associated with this insect. Granovsky. Wisconsin. There may be an earlier record.

EMPOASCA MALI

Yellows. Bean to bean. R. C. Smith & Barker. Haiti. It has not been proven definitely that this disease is due to a virus.

EPITETRANYCHUS ALTHIAEAE

1935. Virus disease. Legume to legume. Dounine, Russia.
No definite data.

EPITRIX CUCUMERIS

1924. Mosaic. Tomato to tomato. Dickson. Canada.

EUTETTIX TENELLUS

1927. Curly top of sugar beet. Sugar beet to tomato. McKay & Dykstra. Pacific Coast.

Tomato yellows (curly top of sugar beet). Tomato to tomato. McKay & Dykstra. Oregon.

HYALOPTERIS ATRIPLICIS

1933. Mosaic. Bean to bean. Zaumeyer. U. S.

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

1933. Mosaic. *Pisum sativum* to *P. sativum*. Doolittle & Jones. U. S.

HYALOPTERIS PRUNI

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

HYSTERONEURA SETARIAE

1936. Mosaic. Sugar cane to Sugar cane. Ingram & Summers. Louisiana.

ILLINOIA PISI

1934. Common bean mosaic. Bean to bean. Price. New Jersey.

1934. Yellow bean mosaic. Bean to bean. Price. New Jersey.

1934. Mosaic. Alfalfa to alfalfa. Price. New Jersey.

ILLINOIA SOLANIFOLII

1933. Mosaic. Bean to bean. Zaumeyer. U.S.

LYGUS PRATENSIS

1935. Mosaic. Swede to swede. Pape, Germany.

MACROSIPHUM sp.

1918. Spinach blight. Spinach to spinach. McClintock & Smith. Virginia.

1933. Virus A. Potato to potato. Loughnane. Ireland. Mosaic of sugar beet. No data.

MACROSIPHUM AMBROSIAE

1933. Mosaic. Bean to bean. Zaumeyer. U.S.

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MACROSIPHUM ARTEMESIAE

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MACROSIPHUM GEI (*M. solanifolii*)

1935. Fern leaf of tomato. Jones & Burnett. Washington.

Same as cucumber mosaic.

1931. Mosaic. Pea to pea. Osborn. New Jersey.

MACROSIPHUM GRAVICORUS

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MACROSIPHUM IMPATIENTICOLENS

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MACROSIPHUM PELARGONIUM

1927. Mosaic. *Vicia faba* to *V. faba*. Böning. Germany.

1930. Leafroll of potato. Potato to potato. Oregon.

MACROSIPHUM PISI

1930. Leafroll of potato. Potato to potato. Oregon.

1932. Mosaic. Clover to clover. Dickson. Canada. He used *Trifolium pratense*, *T. hybridum*, *T. repens*, *T. incarnatum*, *M. lupina*, & *M. officinalis*.

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MACROSIPHUM PURPURASCENS

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MACROSIPHUM ROSAE

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MACROSIPHUM RUDBECKIAE

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MACROSIPHUM SOLANIFOLII

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

1933. Mosaic. Cucumber to spinach. Hoggan. Wisconsin.

1923. Leafroll. Potato to potato. Schultz & Folsom. Maine.

1923. Spindling tuber. Potato to potato. Schultz & Folsom. Maine.

1928. Mosaic. Sugar beet to sugar beet. van der Meulen. Holland.

1933. Veinbanding. Potato to potato, Koch. Wisconsin.

1935. Calico. Potato to potato. Porter California.

MACROSIPHUM SONCHI

1935. Mosaic. Lettuce to lettuce. Ogilvie. England. Suspected as result of preliminary experiments.

MACROSIPHUM TABACI

1914. Mosaic. Tobacco to tobacco. Allard. Washington. Not proven by cage experiments.

MACROSIPHUM TARAXACI

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MACROSIPHUM ULMARIAE

1928. Mosaic. Sugar beet to sugar beet & potato. van der Meulen & Qvanjer. Holland.

MAMESTRA BRASSICAE

1927. Mosaic. Potato to potato. Elze. Holland.

MONELLIJA CARYELLA

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MONELLIJA CARYAE

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MYZOCALLIS ALHAMBRA

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MYZOCALLIS ASCLEPIADIS

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MYZOCALLIS ONONIDIS

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MYZUS CERASI

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MYZUS CIRCUMFLEXUS

1921. Mosaic. Chinese mustard. & turnip. to some. Schultz-Maine.
 1922. Mosaic. Beet to beet. Robbins. Colorado.
 1922. Mosaic. Beet to beet. Robbins. Colorado.
 1932. Mosaic. Potato to potato. McKay & Dykstra. Oregon.
 1932. Mild mosaic. Potato to potato. McKay & Dykstra. Oregon.
 1932. Leaf rolling mosaic. Potato to potato. McKay & Dykstra. Oregon.
 1932. Crinkle. Potato to potato. McKay & Dykstra. Oregon.

MYZUS FRAGIFOLII

1933. Crinkle. Strawberry to strawberry. Vaughan. Oregon.

MYZUS HIERACII

- Mosaic. Lettuce to lettuce. Böning. Germany.

MYZUS MONARDAE

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MYZUS PERSICAE

1919. Mild mosaic. Potato to potato. Schultz & Folsom-Maine.
 1928. Mosaic. *Vicia faba*. var. *major*, *Sinapsis alba*, *Rumex domesticus*, *R. crispus*, *Tusilago farfara*, *Polygonum persicaria*. van der Meulen. Holland.
 1929. Veinbanding. Tobacco to tobacco. Valteau & Johnson. Kentucky.
 1930. Crinkle of potato. Potato to tobacco. K. M. Smith. England. Note-Transmits virus Y only. Both X and Y are transmitted by needle.
 1931. Cucumber mosaic. Tomato to tobacco.
 1932. Spotted wilt of tomato. *Datura stramonium* & *Capsicum* sp. to *D. stramonium* & *Capsicum* sp. K. M. Smith. England.
 1933. Crinkle of strawberry. Strawberry to strawberry.
 1933. Crinkle of strawberry. Strawberry to strawberry. Vaughan. U. S.
 1933. Leaf roll. Potato to *S. dulcamara*, *S. villosum*, and *D. stramonium*. Dykstra. U. S.
 1933. Veinbanding. Potato to tomato, Dykstra reported that this component only was transmitted from rugose mosaic.
 1933. Virus A of potato. Potato to potato. Clinch. Ireland.
 1933. Leaf roll of potato. Potato to tomato, pepper, *D. stramonium*, *D. tatula*, *S. dulcamara* and *S. nigrum*.

1933. Mosaic. Bean to bean. Zaumeyer. U.S.
1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.
1934. Bigarrure of potato. Verplancke, Belgium.
1935. Fern leaf of tomato. Tomato to tomato. Jones & Burnett. Washington. They believe this is cucumber virus.
1935. Yellow mosaic. Cucumber to cucumber. Hoggan. Wisconsin.
1934. Virus Y of potato. Transmitted independently of the X virus when associated. K. M. Smith & Dufrenoy. England.
1935. Sore shin of *Lupinus angustifolia*. Garden pea to garden pea. Chamberlain. Australia.
1935. Mild mosaic. Cucumber to cucumber. Hoggan. Wisconsin.

NOTE: Vallean & Johnson. Kentucky say that "*Myrus persicae*", rarely if ever transmits the healthy potato virus, while it regularly transmits the vein-banding virus from virus mixtures.

NOTE: Mosaic of *Cheiranthus cheiri* appears transmitted among several hosts, especially Cruciferae.

1928. Mosaic. Sugar beet to sugar beet, potato & spinach.
van der Meulen & Quanjér. Holland.

MYZUS POROSUS

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

MYZUS PSEUDOSOLANI

1931. Leafroll. Potato to potato. Murphy & McKay. Ireland.
1929. K. M. Smith. England. 1931.
1931. Tobacco mosaic and yellow mosaic of tobacco from tomato but not from tobacco. Hoggan. Wisconsin.

MYZUS SOLANIFOLII (*Macrosiphum gei*)

1926. Mosaic. Potato. Murphy & McKay. Ireland.

NEMATUS VENTRICOSA.

1930. Mosaic. *Convolvulus arvensis* to *C. arvensis*. Blattny. Czechoslovakia.

NEOPHOTETTIX APICALIS var. CINCTICEPS

NOTE: The period of study of the dwarf of rice appears to have started about 1897.

PERIPHYLLUS NEGUNDINIS

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

PERIPHYLLUS POPULICOLA

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

PHILAENOUS SPUMARIUS

1923. Leaf roll. Potato to potato. Murphy. Ireland.

PROCIPHILUS CORRUGATANS

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

PSYLLOIDES AFFINIS

1923. Leaf roll of potato. Potato to potato. Murphy. Ireland.

RHOPALOSIPHUM (MYZUS) PERSICAE

1928. Mosaic. *Vicia faba* var. *major* to *V. faba* var. *major*. van der Meulen. Holland.

RHOPALOSIPHUM PSEUDOBRASSICAE

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

1936. Mosaic. Bean to bean. Zaumeyer & Kearns. U. S.

RHOPALOSIPHUM RHODIS

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

THAMNOTETIX GEMINATUS

1934. California aster yellows and celery yellows. Severin. California.

THAMNOTETIX MONTANUS

1934. California aster yellows & celery yellows. Severin. California.

THRIPS sp.

1935. Stolbur. Appears to be vector of this disease which occurs on *Lycopersicon esculentum*, *Atropa belladonna*, *Datura stramonium*, *Nicotiana tabacum* and *Convolvulus arvensis*, Koratshevsky, Russia.

THRIPS TABACI

1927. Mosaic. Spinach & beet to spinach & beet. Proof not positive.

Potato leaf roll. K. M. Smith used many hosts.

1932. Virus disease of tobacco. Moore. Africa, K. M. Smith (1933) suggested that this disease might be due to the same virus as yellow spot of pine apple in Hawaii and spotted wilt of tomato.

THRIPSAPHIS BALLI

1933. Yellow dwarf of onion. Onion to onion. Drake, Tate & Harris. Iowa.

TIPULA PALUDOSA (larval form)

1927. Potato virus disease. Elze. Holland.

TOROPTERA GRAMINUM

1936. Mosaic. Sugar cane to sugar cane. Ingram & Summers. Louisiana. Two case only.

TRIALENOIDES VAPORARIORUM

1930. Cucumber mosaic. Cucumber to cucumber. Bewley & Corbett. England. One case.

TYPHOLORYBA ULMI

1923. Leafroll. Potato to potato. Murphy. Ireland.

ZOSMENUS QUADRATUS

Mosaic. Beet to beet. Germany.

ERRATA**TO THE INDEX OF THE VECTORS OF VIRUS DISEASES OF PLANTS**

Journal of the University of Puerto Rico. Vol. XIX, No. 3, pp. 407-420, 1935.

Page 413, line 6—should read *Cicadulina*.

Page 418, line 11—M. A. Watson writes to the compiler as follows: "Dr. K. M. Smith's remarks applied only to Hy. II and Hy. IV, which he regards as strains of Potato mosaic. Hy. III is an entirely different virus and does not go into potato at all. Hy. IV may be the same as Potato virus X but neither of these viruses is transmitted by *M. persicae*."

SECOND SUPPLEMENT

TO

PARTIAL BIBLIOGRAPHY OF VIRUS DISEASES OF PLANTS *

By JOSÉ I. OTERO, *Librarian*, and MELVILLE T. COOK, *Plant Pathologist*,
Agricultural Experiment Station, College of Agriculture of the University of
Puerto Rico, Río Piedras, P. R.

Afzal, H. M., Jaggi, S. S. & Singh, B.

A note on a survey of the disease of malformation in the Punjab-American cottons. *Indian Journ. Agric. Sci.* 5(5): 624-631, 1935.

This disease has been tentatively identified as stenosis. Although this is not strictly a virus disease paper we decided to include it, because some workers have regarded stenosis as a virus disease.

Agee, H[amilton] P[oep]

The Hawaii system of sugar-cane quarantine. *Proc. Fifth Congress Soc. Sugar Cane Tech. Brisbane, Australia*, 1935: 707-710, 1935.

This paper contains one paragraph on *Perkinsiella saccharicida*.

Ainsworth, G. C.

Fig mosaic. *Journ. Roy. Hort. Soc.* 60(12): 533, 1935.

Report of a fig mosaic in Great Britain. The author claims that although there is no printed record of such maladie occurring in Great Britain it has been known for at least twenty years.

Virus diseases of cucumbers. *Journ. Minis. Agric.* 42(4): 338-344, 1935.

Brief popular descriptions of (1) green-mottle mosaic (cucumber virus 3), (2) yellow mosaic (cucumber virus 4) and (3) yellow mottle mosaic (cucumber virus 1). Also a brief discussion of the causative agents, transmission of the diseases and methods of control.

Another new virus disease of tomato. *Gard. Chron.* 98(2549): 320-321, 1935.

A description of a disease reported by K. M. Smith, June 1, 1935. Produces enations similar to those described by Jensen on tobacco. The disease is due to ordinary tomato mosaic virus.

* *Journ. Agric. Univ. Puerto Rico* 18(1-2): 1-410, 1934. *First Suppl.* 19(2): 129-313, 1935.

Spotted wilt of *Richardias* (Arums). Gard. Chron., 97(2507) = 31. 1935.

A short illustrated note indicating the symptoms and suggesting control measures.

"Bushy stunt": a virus disease of the tomato. Journ. Min. Gt. Brit. 43(3):266-269, 1936.

Detection of spotted wilt virus in chrysanthemums. Nature 137: 868, 1936.

The disease is abundant on ornamental plants. The virus is inactivated by an extract of healthy chrysanthemum leaves added to an extract of diseased tomato leaves.

-----, & Selman, I. W.

Some effects of tobacco mosaic virus on the growth of seedling tomato plants. Ann. Appl. Biol. 23(1):89-98, 1936.

Johnson tobacco virus No. 1 was used. The authors give the results of a series of experiments which they summarize as follows:

"A negative correlation has been shown to exist between the growth rate of seedling tomato plants and the length of the incubation period.

"Evidence has been presented, which suggests that the relative effects of tobacco virus 1 on the growth rate of the plant subsequent to the appearance of symptoms is the same in both summer and winter.

"The percentage water content of all parts of infected plants was found to be lower than that of the controls, during the early stages of the disease. Later the water content tended to rise above that of healthy plants."

Anderson, Rudolph Daniel

A study of some abnormalities occurring in certain potato varieties in California. Colorado Agric. Expt. Sta. Tech. Bull. 16, 52 p., 1936.

Contains some interesting data on virus diseases.

Anonymous

Leaf-roll and mosaic diseases of the potato. Ireland, Dept. Agric. Leaflet 29, 1933.

The growing and marketing of potatoes for seed. Ireland, Dept. Agric. Leaflet 8, 1934.

New York Cornell Agric. Expt. Sta. Forty-seventh Annual Report for the year 1933-34:102, 1935.

Note on work in progress.

 Die Blattrollkrankheiten der Kartoffel. Ernährungstörung oder infektion? Ungelöste Probleme. Der Kartoffelbau 18. Jahrgang, 1934: 29-30, 1934.

 The propagation and maintenance of healthy stocks of potatoes. Gov't. of Northern Ireland, Min. of Agric. Leaflet 73:8, 1934.

 Annotated bibliography on bitter-pit. Occ. Pap. Bur. Fruit Prod. E. Malling, 3:28, 1934.

Although it has not been proved to the satisfaction of all workers that bitter-pit is due to a virus, this publication will be found useful. Contains list of papers since 1869 on bitter-pit of apples.

 Our changing agriculture served by Science. Fiftieth Annual Report of the Dir., 1932-33, Wisconsin Agric. Expt. Sta. Bull. 428:8, 1934.

A brief note saying that yellow dwarf of potatoes causes a decrease in yields.

 Mosaic disease of the sugar cane. Science (Suppl.) 82(2122): 7-8, 1935.

A statement that Dr. E. W. Brandes and Julius Matz of the U. S. Dept. of Agriculture have discovered that the sugar cane plant fights mosaic "with a virus-paralyzing substance that it forms in the growing tips of its stalks. A stuff that seems to be somewhat analogous to the germ-fighting 'anti-bodies' formed in the bodies of human beings and animals when invaded by disease."

 Mosaikayge hos agurker. Gartri-tid. 51:417-419, 1935.

 Mosaic and nature of virus disease. Int. Sugar Journ. 37:460-461, 1935.

 New sugar-beet varieties for the curly-top area. U. S. Dept. Agric. Circ. 391. 4 p., 1936.

 Plum and peach virus diseases. Amer. Fruit Grower 56:31, 1936.

 Virus diseases. Gard. Chron. (London) 99:209, 1936.

Anstead, Rudolph D.

Mosaic Disease. Madras Agric. Dept. India, Bull. 92:13. (n.d.)

A popular description of sugar cane mosaic and suggestion for its control.

Appel, [Friedrich Carl Louis] Otto

Vitalitat und Vitalitätsbestimmung bei den kartoffeln de Kartoffel 13:20-21, 1933.

Arnaud, G., & Arnaud, M.

Les maladies á virus des rosacées amygdalées (Virus disease of the amygdalous rosaceae.) Compt. Rend. Acad. Sci. Paris 202(10):869-871, 1936.

Atanasoff, D[imitr]

Old and new virus diseases of trees and shrubs. Phytopath. Zeitschr. 8(2):197-223, 1935.

The author observed the following virus diseases in Bulgaria: mosaic of *Populus balsamifera*, *Corylus avellana*, *Ulmus* sp., *Acer negundo*, *Cornus mas*, ash and lilac. Also infectious variegations of *Labrum vulgare* and 'witches' broom of *Gleditschia triacanthos*.

Atkinson, J. A.

Progress report on the investigations of corky-pit of apples. New Zealand Journ. Sci. & Tech. 16(5):316-319, 1935.

This disease has not been proved to be due to a virus but has certain resemblances which make it desirable to include it in this publication.

Bailey, M. A.

Leaf curl disease of cotton in the Sudan. Empire Cotton Growing Rev. 11(4):1-9, 1934.

A very comprehensive review of the history of this disease.

Bald, J[ames] G[rieves]

Statistical aspect of the production of primary lesions by plant viruses. Nature 135(3424):996, 1935.

A criticism of a paper by Youden, Beale & Guthrie. (Cont Boyce Thomp. Inst. 7:37, 1935.)

Baribeau, [Charle Henri] B[ernard]

The tuber-unit seed plot in Quebec. Amer. Potato Journ. 12(3):62-64, 1935.

Report of a potato tuber-unit seed plot which is considered to demonstrate clearly the value of this method of combating virus diseases.

Barrus, M[ortier] F[ranklin] & Crosby, Cyrus R[ichard]

Control of diseases and insect pests of potatoes in Long Island. Cornell Agric. Expt. Sta. Ext. Bull. 288, 26 p., 1935.

An outline for potato growers of control measures for virus diseases and other groups of maladies.

Baudys, E[duard]

Nejdůležitější choroby a škůdci Merunki a Broskvene a ochrana proti nim. (The most important diseases and pests of the apricot and peach and their control.) Publ. Fytopath. Sekce Zemsk. Vyzk. Ust. Zened. 147, Zidlochovice, 55 p., 1935.

An annotated list of the most important diseases of the peach and the apricot giving attention to those caused by viruses. Control measures in each individual case are discussed in details.

Bawden, F. C.

The relationship between the serological reactions and the infectivity of potato virus X. Brit. Journ. Expt. Path. 16: 435-443, 1935.

A careful study containing much data on this subject.

-----, **& Pirie, N. W.**

Experiments on the chemical behavior of potato virus X. Brit. Journ. Expt. Path. 17: 64-74, 1936.

This paper gives the results of the studies in which the authors determined the relation of the virus to several chemicals.

Bechhold, H.

Subvisibles virus und Kolloidforschung. Kolloidztsehr. 51: 134-144. 1930.

-----, **Gerlach, W., & Erbe, F.**

Die Kupferprobe zur unterscheidung von gesunden und abgebannten Kartoffeln. (The copper test for differentiation of healthy and degenerated potatoes.) Angew Chemie 47(2): 26-30, 1934.

A sheet of copper is inserted into a tuber for 8 hours at 37°C. followed by 16 hours at room temperature. On cutting the healthy tuber show a dark brown to dark color. The diseased tubers do not.

Bell, Arthur F[rank]

Disease resistant trials in Queensland. Proc. Fifth Cong. Int. Soc. Sugar Cane Tech., Brisbane, Australia, p. 511-517, 1935.

This paper includes a discussion on Fiji disease of sugar cane.

The present status of dwarf disease. Proc. Queensland Soc. Sugar Cane Tech. 7: 129-131, 1936.**Bennett, C[arlyle] W[ilson]**

Studies on the properties of the curly top virus. Journ. Agric. Res. 50(3): 211-214, 1935.

The author describes his methods in details. The aging of the virus depends on the medium and ranged from 7 to 28 days. Also resistance to desiccation reported on the medium and ranged from

2 to 10 months. Thermal inactivation point between 75 and 80 degrees C. No virus was recovered from liquids having a pH of 2.9 or lower. A very high resistance to chemicals.

Berkeley, G[arven Hugh]

Three diseases of lilies. Canadian Florist. 30(20):307-308, 1935.

This paper contains a popular discussion of the mosaic disease.

Occurrence of "spotted wilt" on tomatoes in Ontario. Sci. Agric. 15(6):387-392, 1935.

A description of symptoms on tomato and a study of the disease on *Nicotiana glutinosa*.

Berkner, F. W.

Eisenfleckigkeit bei kartoffeln. Wesentliche Sortenunterschiede-Abhängigkeit der befallstärke von jahreswitterung und boden. Mitt. Landw. 49:378-380, 1934. (Zeitsch. Pflanzenk u. Pflanzenschutz 45:239. Die Kartoffel 14:78-81, 1934. Neuh. Geb. Pflanzensch. (abstract) 1935:85, 1935.)

Der Einfluss zurückliegender Kalidüngungen auf das Trachtenbild (Abbauerscheinungen) sowie die Nährstoffaufnahme und die späteren Erträge der Kartoffel-pflanze. III Mitteilung. (The influence of past applications of potash fertilizers on the performance (degeneration phenomena), assimilation of nutriment, and subsequent yields of the potato plant. No. III.) Landw. Jb. 81(3):293-423, 1935.

This is a detailed account of the results obtained by experiments conducted by the author. The forms of "degeneration" observed were mosaic, leaf roll and dwarfing. A noticeable increase in all the mentioned diseases, scab and "Eisenfleckigkeit" appeared to result from the potash treatment.

NOTE: The results obtained are rather in opposition with those obtained by G. Rhode (Ernähr. Pflanz. 31(13-14):237-243, 1935.)

Best, R. J.

Precipitation of the tobacco mosaic virus complex at its isoelectric point. Austral. Journ. Expt. Biol. & Med. Sci. 15(1):1-13, 1936.

Bessey, E. A.

Michigan State Board of Agric. Seventy-second Annual Report of the Secretary of the State Board of Agric. and Forty-sixth Annual Report of the Expt. Station from July 1, 1932 to June 30, 1933:314, 1933.

A brief note of work in progress.

Birkeland, Jorgen M.

Further serological studies of plant viruses. *Ann. Appl. Biol.* **22**(4): 719-727, 1935.

These experiments indicate that the virus is, in itself, antigenic; that cucumber mosaic, tobacco ring spot and tobacco mosaic are serologically distinct and that tobacco mosaic virus, aucuba mosaic virus (green and yellow strains), and probably tomato streak virus are serologically indistinguishable.

On the classification of plant viruses. *Phytopathology* **25**(5): 456-458, 1936.

The results of studies which suggest that the serologic tests may be useful in the classification of viruses.

Bitancourt, A[gegislan]

Um protozoario parasita do Cafeeiro. (A protozoon parasitic on coffee) *Rev. Inst. Café* **10**(107): 2486-2490, 1935.

The author reports a cochineal insect (*Cerococcus parahybensis*) and the protozoon *Rhizococcus coffeae* associated with coffee phloem necrosis. The paper is not strictly on virus, but as he discusses Stahel's observations on the subject we decided to include this citation considering it of interest to the students on the subject.

Black, L. M.

Some insect and host relationship of the potato yellow dwarf virus. *Phytopathology* (Abstract) **26**(2): 87, 1936.

Abstract of paper read before the 27th Annual Meeting of the American Phytopathological Society, St. Louis, Mo. Dec., 1935. *Accrategallia sanguinolenta* is a vector and *Trifolium pratense* is a host plant.

Blank, L. M.

A mosaic on cabbage in Wisconsin. *Phytopathology* (Abstract) **25**(1): 6, 1935.

This paper appeared in our First Supplement under Black, L. M.

Blattny C[tibor Eugen Marie Karel], & Vukolov, V.

Nakazliva neplodnost Chmele (Infectious sterility of the hop.) *Rec. Inst. Rech. Agron. Rep. Tchecosl.* 1936, **137**: 3-18, 1935.

Account of the author's studies since 1924 of the hereditary or infectious sterility of hops in Czecho-Slovakia. The disease is well described showing an extensive phloem necrosis of all the non-lignified organs. The work on transmission is also described and is attributed to a virus that may be of a complex nature suggesting that it may have originated from the disassociation of the virus of the "Kaderavost" disease.

Ozdravovací pokus se sorton Bramborů "Pražské rohliky".
(An attempt to restore the health of the potato variety
"Prazske Rohliky.") Rec. Inst. Rech. Agron. Rép. Tchécosl.
1935, **137**: 33-38, 1935.

Account of the author's eight years work trying to free a potato
variety from virus diseases.

Prispevek K léčení virových chorob Bramborů. (Contribution
to the therapy of the virus diseases of the potato.) Rec. Inst.
Rech. Agron. Rép. Tchécosl. 1935, **137**: 39-42, 1935.

Brief report of an experiment in trying to cure virus diseases by
therapeutical methods.

Pokus o vlivu zavlahy a vlivu doby sázení na zdravotní stav
Bramborů. (Experiment on the influence of watering and
of date of sowing on the health of potatoes.) Rec. Inst. Rech.
Agron. Rép. Tchécosl. 1935, **137**: 43-47, 1935.

The author reports the results of his experiments on watering and
time of planting potatoes. Late planting and over-watering re-
duced virus diseases (leaf roll crinkle, mosaic and stipple-streak).
A noticeable reduction of the number of aphids was demonstrated,
to it was attributed the success in reducing the spread of the
disease. Experimental work in regard to aphid control was also
conducted with derris and pyrethrum powder.

, & Vukolov, V.

Studie Z pathologie chmele a Bramborů (Pathological studies
on hop and potato.) Sbornik Vyzkumnych u. 1 tavú zeme-
delskych C.S.R. Svazek **137**, 47 p., 1935.

Contains some notes on virus diseases of potatoes and hops.

Blood, H[erbert] L[oren]

An unusual occurrence of "spotted wilt" of tomato in Utah.
U. S. Dept. Agric. Plant Disease Rep. **20**(9): 143-144, 1936.

A record.

Bodine, E. W.

Peach mosaic disease in Colorado. Colorado Agric. Expt. Sta.
Bull. **421**, 11 p., 1936.

A description of the disease and recommendations for its control.

Boss, Andrew

Forty-first Minnesota Agric. Expt. Sta. Ann. Rpt. July 1, 1932
to June 30, **1934**: 7, 1934.

Brandes, E[lmer] W[alker.] & Matz J[ulius]

Recovery of the sugar cane plant from the mosaic disease. Paper presented to 5th Congress of the International Association of Sugar Cane Tech. (Facts About Sugar (Abstract) 30(11): 425, 1935.)

-----, & -----

Importance of the virus diseases of sugar cane. Proc. Fifth Congress Int. Soc. Sugar Cane Tech. Brisbane, Australia p. 87-105, 1936.

A very excellent review of the subject including descriptions of the diseases and methods of control.

Transmission of new types of sugar cane mosaic and some observations on significance of the diseases. Proc. Fifth Congress Int. Soc. Sugar Cane Tech. Brisbane, Australia, p. 804-811, 1936.

This may be considered a progress report. It contains a careful and thorough discussion of the methods of work.

Brentzel, W. E.

Types of potato virus diseases in North Dakota. North Dakota Agric. Expt. Sta. Bull. 282, 23 p., 1935.

Popular.

Caldwell, John

Spurious cucumber "mosaic" due to copper poisoning. Journ. Min. Agric. Great Britain 42(2): 97-98, 1935.

A description.

On the interactions of two strains of a plant virus: Experiments on induced immunity in plants. Royal Soc. (London), Proc. Ser. B: 117, 1935, No. B-803: 120-139, 1935.

The author reports two strains of the virus of the aucuba mosaic of tomato. A. G. causes a green mottling and A. Y. causes a yellow mottling. The yellow strain is similar to Johnson's tobacco virus No. 6, but both show some differences.

Caminha, A.

Co. 290 cane at Campos, Brazil. Observations on cane culture in Brazil. Brazil Assuc. 5(3): 127-138; (4): 335-341, 1935. (Facts About Sugar (Abstract) 30(8): 304-305, 1935.)

Account of variety resistance to mosaic.

Carsner, Eubanks

Results from U. S. No. 1 resistant beet seed. Facts About Sugar 30(2): 70, 1935.

Brief popular notes on yields.

Carter, Walter

Mealy-bug wilt and green spot in Jamaica and Central America. *Phytopathology* **24**(4): 424-426, 1934.

The Smooth Cayenne pineapple appears to have disappeared as a result of the wilt and the Red Ripley is becoming scarce.

The symbionts of *Pseudococcus brevipes* (Ckl.) *Ann. Ent. Soc. Amer.* **28**(1): 60-64, 1934.

This paper is of interest because this insect is a vector of pineapple wilt which is similar to the virus diseases.

Mass action phenomena in mealybug wilt. *Ann. Ent. Soc. Amer.* **28**(3): 396-403, 1935.

This paper is of interest because this disease is very similar to the virus diseases.

Studies on biological control of *Pseudococcus brevipes* (Ckl.) in Jamaica and Central America. *Journ. Econ. Ent.* **28**(6): 1037-1041, 1935.

This paper is of interest to students of virus diseases because this insect is a vector of pineapple wilt.

Insects and Plant diseases (Presidential Address). *Proc. Hawaii Ent. Soc.* **9**(2): 159-170, 1935.

A popular discussion on the insect transmission of virus diseases and virus-like diseases of plants.

Mechanical transmission of two viruses to pineapple. *Phytopathology* (Abstract) **25**(1): 10, 1935.

The toxicogenic and toxiniferous insect. *Science* **83**: 522, 1936.

A brief discussion which is of interest to students of virus diseases.

The symbionts of *Pseudococcus brevipes* in relation to a phyto-toxic secretion of the insect. *Phytopathology* **26**(2): 176-183, 1936.

Insects that are transferred from pineapple to *Panicum barbinode* lose the power to produce green spots on pineapple after a time. The symbiont is pleomorphic and passes from a rod to a coccus form. It does not regain the rod form after the insect is returned to the pineapple.

Cation, D[onald]

The role of plums in the spread of peach virus diseases. *Ann. Rpt. State Hort. Soc. Michigan*, **65**: 61-63, (1935), 1936.

Popular.

Caudwell, E. S.

Cane experiments at Umbogintwini. *Sugar and Cotton Planter*, **II**(6): 7-9, 1926.

This paper is a record of a field test of streak of sugar-cane.

Chamberlain, E. E., & Taylor, G. G.

The occurrence of spotted-wilt of tomatoes in New Zealand. *New Zealand Journ. Agric.* **52**(1): 9-17, 1936.

Popular.

Sore-shin of blue lupins. *New Zealand Journ. Agric.* **51**(2): 86-92, 1935.

A disease that is very destructive on *Lupinus angustifolius*. It causes a mosaic of peas, broad bean and red clover. It is readily transmitted by *Aphis rumicis* and *Myzus persicae*. Experiments indicate that it is not transmitted by seeds. It overwinters in the red clover.

Chapman, G[eorge] H[enry]

Crack-neck: A non-parasitic disease of Chrysanthemums. *Phytopathology* **9**: 532-534, 1919.

It is possible that this is a virus disease.

Chester, K[enneth] S[tarr.]

Serological evidence in plant-virus classification. *Phytopathology* **25**(7): 686-701, 1935.

The author gives a historical review of the subject and methods. The results are summarized as follows: The test show the following virus types to represent distinct serological entities: tobacco mosaic, latent mosaic of potato, potato mild mosaic, potato aucuba mosaic, potato-vein-banding virus, tobacco ring spot, and Osborn's pea-mosaic virus No. 2.

From tobacco mosaic have been derived many strains of very close affinity serologically, although of very diverse symptomatology. The group of such uniformly interreactive viruses includes tobacco aucuba mosaic, Johnson's yellow tobacco virus 4, Holmes' symptomless tobacco mosaic, and many of Jensen's brilliant yellow, white, and slow-moving types.

The latent-mosaic virus of potato (X-virus or healthy-potato virus) is representative of a group of serologically closely related virus strains embracing potato mottle, potato ring spot, and British Queen streak. According to Birkeland's tests (5), spot necrosis and at-

tenuated spot necrosis also belong in the same group. Rugose-mosaic virus of potato reacts with both X-virus and vein-banding sera, confirming the present view that it is a mixture of these two virus types.

The vein-banding virus of potato and cucumber-mosaic virus are so strongly interactive that these appear to be but strains of the same virus type.

This relationship is supported by infection tests. Valteau's tobacco virus 10729 also shows marked affinities with these viruses.

A much more distant serological relationship between tobacco mosaic and severe etch of tomato is indicated by precipitin tests.

Two viruses isolated from legumes by Osborn and tentatively referred to as pea-mosaic viruses No. 2 and No. 3 behave serologically as strains of the same virus type, although both are serologically distinct from all of the other viruses studied."

The antigenicity of the plant viruses. *Phytopathology* 25(7): 702-714, 1935.

The author gives the results of extensive experiments and says: "From these findings, as well as from the facts previously reported concerning virus neutralization, the possibility of arriving at a logical classification of viruses by means of serological reactions, and the correlation between strength of serological reactions and the amount of infective material present in tests samples, it is concluded that the evidence now available is sufficiently strong to warrant the assumption that the antigens responsible for the plant virus serological reactions thus far studied are the viruses themselves and not normal or derived constituents of diseased plants."

A serological estimate of the absolute concentration of tobacco mosaic virus. *Science* 82(2114):17, 1935.

After a brief review of the work of other students the author concludes "that a single animal dose on *N. glutinosa* corresponds to 60-600 million molecules of virus antigen."

Choudina, I.

(Virus diseases of tobacco in the U.S.S.R. and methods for their control.) *Trans. Lenin Acad. Agric. Sci.* 1936: 32-41, 1936.

Paper read before the First Virological Conference, March 7-11, 1935. A Discussion of the known diseases, most of which are known in the United States. The speck spot of tobacco is transmitted in the seeds. Recommendations for control.

Chu, H. S.

On the mosaic disease of wheat. *Entom. & Phytopath. Hangchow, China* 4(2):22-27, 1936.

Connors, I. L.

Fourth Annual Report of the Canadian Plant Disease Survey, 116 p., 1935.

In this report is included the new record for Canada on a mosaic on seed mangolds and on Swiss chard. Also a new mosaic disease on cherry.

Cook, Melville T[hurston]

A mosaic disease of *Tithonia rotundifolia*. *Phytopathology* 26 (2): 90, 1936.

Abstract of paper read before the 27th Annual meeting of the American Phytopathological Society, St. Louis, Mo., Dec., 1935. The host plant was incorrectly determined. It was *T. diversifolia*.

Index of the vectors of virus diseases of plants. *Journ. Agric. Univ. Puerto Rico*, 19(3): 407-420, 1935.

A list of vectors arranged alphabetically. Under each vector is a list of the diseases which it transmit with date of first record, place and name of report.

Host index of virus diseases of plants. *Journ. Agric. Univ. Puerto Rico*, 19(3): 315-406, 1935.

A list of virus diseases that have been reported, arranged according to families, genera and species.

Phloem necrosis in the stripe disease of corn. *Phytopathology* 26(2): 90, 1936.

Abstract of paper read before the 27th Annual meeting of the American Phytopathological Society, St. Louis, Mo., Dec., 1935.

Cooley, L. M.

Virus-free raspberries. *Rural New York*, 94: 385, 1935.

Popular.

The identity of raspberry mosaics. *Phytopathology* 26(1): 44-56, 1936.

The author gives the results of studies and recommends the use of two terms to include all raspberry mosaics,—green mottle mosaic and yellow mosaic.

Corneli, E.

Mal del mosaico su patate (Mosaic disease of potato.) Rilievi Fitopt. Lab. & Osser. Pat. Veg. R. Inst. Sup. Agr. di Perugia, Memoria 26: 61, 1933.

Brief popular note.

Costantin, Julian [Noel]

Experiences culturales sur la pomme de terre dans les Pyrénées.
Compt. Rend. Acad. Sci. (Paris) **198**:22-26, 1934.

Notion nouvelle de l'Erulement doux de la pomme de terre.
Compt. Rend. Acad. Sci. (Paris) **198**:299-302, 1934.

Extériorisation des dégénérescences par l'action de l'altitude,
Compt. Rend. Acad. Sci. (Paris) **198**:1095-1097, 1934.

Influence des hautes latitudes sur les rendements agricoles de la
pomme de terre dans l'Amérique du Nord. Compt. Rend.
Acad. Sci. (Paris) **199**:690-694, 1934.

Culture de la pomme de terre au Maroc en 1933. Compt. Rend.
Acad. Agric. Sci. (Paris) **20**:146, 1934.

L' enrroulement de la variété de Pomme de terre Belle de Juillet.
(Leaf roll in the Belle de Juillet potato variety.) Compt.
Rend. Acad. Sci. (Paris) **201**(23):1080-1083, 1935.

The author states that Belle de Juillet potato variety suffer to the
extent of 100 per cent from leaf roll in low-lying situations. He
gives details of his experiments to cure leaf roll and mosaic at high
altitudes in the Pyrenees, at 1,400 m. above sea level.

, & Magrou, J[oseph]

Étude des mycorrhizes de la Pomme de Terre sur des pieds sains
et sur des pieds atteints de mosaïque. (Study of potato my-
corrhiza on healthy plants and on plants affected with mo-
saic.) Rev. Path. Vég. **22**(1):60-62, 1935.

Report of the behavior of potato varieties at different altitudes
and affected with mosaic and its reaction to mycorrhiza.

Cotton, A[rthur] D[isbrowe]

The aphid carrying lily mosaic. Royal Hort. Soc. Lily Year-
Book **3**:89-91, 1934.

Aphis gossypii is only vector known. It is less abundant in Great
Britain than in the U. S. which may account for a less rapid spread.

Cottrell-Dormer, W.

The variability of plant pathogens. Proc. Fifth Congress Soc.
Sugar Cane Tech. Brisbane, Australia, p. 713-722, 1936.

This paper contains a brief discussion of variability in viruses.

Cristinzio, M.

Le virosi delle Patate Riccia e Biancona di Napoli nell' annata 1934. (The virus diseases of Neapolitan Riccia and Biancona potatoes in the year 1934.) *Ric. Ossvz. Divulg. Fitopat. Campania ed Mezzogiorno (Portici)* **4**: 51-65, 1935.

Account of reduction in potato yields during 1934 due to several virus diseases.

Cross, W[illiam] E[rnest]

Ensayos y observaciones relativos al efecto del mosaico sobre los rendimientos culturales de las variedades P.O.J. 36, 213 y 2725. (Tests and observations in regard to the effects of mosaic on the cultural yields of the varieties P.O.J. 36, 213 and 2725.) *Rev. Indust. Agric. (Tucumán)* **24**(3-4): 57-76, 1934.

Report of the tests conducted and discussion on the observations. The author declares, that practically, no loss of productivity, is suffered in the province on the three mentioned varieties due to the acquired tolerance after twenty years of cultivation.

Cunha Bayma, A. da

(Mosaic disease of sugar cane in the State of Ceara, (Brazil) *Caripo (Rio de Janeiro)* **4**(7): 74-78, 1933.

The disease spread from certain plantations. Infection ranges from 30 to 100 per cent, and there is a decrease of 80 per cent in sugar productions. Steps have been taken to introduce resistant varieties.

Curzi, M[ario]

Le malattie da virus delle piante. *Ann. Tec. Agric. (Rome)* **7**: 183-196, 257-272, 423-442, 1934.

Dale, H. H.

Viruses and heterogenesis. An old problem in a new form. *Huxley Mem. Lect.* 24 p., 1935.

A summary of the filterable virus problem. The author believes that further studies will result in a biogenesis explanation of the problem.

Dana, B[liss] F.

Occurrence of curly top in Pacific Northwest in 1934. *Plant Disease Reporter* **18**(14): 168-173, 1934.

Account of the unprecedented spread of curly top on different hosts.

Daniels, Leslie B.

The tomato psyllid and the control of psyllid yellows of potatoes. *Colorado Agric. Expt. Sta. Bull.* **410**, 1934.

A description of the diseases and recommendations for its control.

Davies, W. Maldwyn

Ecological studies on aphides infesting the potato crop. *Bull. Ent. Res.* **23**(4): 535-548, 1932.

This is not a paper on virus diseases but it may be of interest to some of the students on insect vectors.

Studies on aphides infesting the potato crop II. Aphids survey: its bearing upon the selection of districts for seed potato production. Ann. Appl. Biol. 21(2):283-299, 1934.

This paper contains a brief discussion of the relations of *Myzus persicae* to virus diseases.

Studies on aphides infesting the potato crop. III. Effect of variation in relative humidity on the flight of *Myzus persicae* Sulz. Ann. Appl. Biol. 22(1):106-115, 1935.

Contains a brief reference to virus diseases.

-----, & Whitehead T[athan]

Studies of aphides infesting the potato crop. IV. Notes as the migration and condition of alate *Myzus persicae* Sulz. Ann. Appl. Biol. 22(3):549-556, 1935.

A discussion of time and environmental conditions.

De Haan, K., & Roland, G.

Enquete internationale sur les différents types de maladies de jaunissement et de mosaïque de la Betterave sucrière quant à leurs caractères et leur influence sur la végétation. (An international inquiry into the different types of yellowing and mosaic diseases of sugar beet in respect to their properties and influence on growth.) Publ. Inst. Belge Amélior. Better. 3(2):55-67, 1935.

Summary of the fifth meeting of the International Institute of Beet Research at Brussels in January 1935. Extensive data is given in regard to "yellowing" and mosaic.

Deighton, F. C.

Mycological work. Sierra Leona Dept. Agric. Rpt. 1933:14-20, 1935.

This report includes notes on cassava mosaic, giving the observations of two years experiments. Reports cases of apparent recovery and that the disease is not seed-borne.

Desai, S. V.

The antigenic properties of the sugar-cane mosaic virus. Curr. Sci. 3(7):28, 1935.

Serological studies.

Organisms associated with sugar cane mosaic, and their relation to the mosaic virus. Indian Journ. Agric. Sci. 5(4):367-386, 1935.

The author obtained a bacterial organism from mosaic of sugar cane. This was grown in culture and developed an invisible filter passing stage.

Dickson, B[ertram] T[homas]

Filterable viruses. Australian & New Zealand Assoc. Adv. Sci. Report, vol. 21, 1933.

A review of the subject.

Dippenaar, B. J.

Fruit spots of the Kelsey and other plum varieties. Farming in South Africa March, 1932, p. 4, 1932.

Popular. Refers to sun-scorch, Kelsey spot and drought spot, cause unknown.

Dodds, H. H., & Beater, B. E.

Proc. South Africa Sugar Tech. Assoc. 1931:116, 1931.

Has some references to virus diseases of sugar cane.

-----, & Fowlie, P.

South African Sugar Tech. Assoc. Proc. 1932:38; 1934:89, 1934.

Has some references to virus diseases of sugar cane.

Doerr, R.

Die submicroscopischen Lebensformen. Verh. d. Schweiz. Naturf. Ges. 1929, II, Teil, 92, 1929.

This paper contains a discussion of tobacco mosaic virus.

Dounine, M. S.

(Virus diseases of leguminous crops.) Lenin Acad. Agric. Sci. Trans. 1936:59-68, 1936.

Paper read before the First Virological Conference, March 7-11, 1935. A review of the subject and recommendations for control. *Epitetranschus althaeae* is mentioned as a vector.

-----, & Rischkow, V[itilij] L.

(Aim and organization of scientific research work on virus diseases of plants in the U.S.S.R.) Lenin Acad. Agric. Sci. Trans. 1936:119-122, 1936.

This paper was read at the First Virological Conference, March 7-11, 1935, it was followed by resolutions on the report of (1) The nature of the viruses. (2) Virus diseases of potato. (3) Virus diseases of tobacco and makhorka. (4) Virus diseases of the cotton plant. (5) Virus diseases of *Leguminosae*. (6) Virus diseases of vegetables. (7) Aim and organization of work regarding virus diseases of plants in U. S. S. R. All of the above was in Russian without English summary.

Duggar, B[enjamin] M[inge], & Easley, Tildon

Comparative effects of certain aldehydes on the viruses of typical tobacco mosaic and tobacco ring spot. Amer. Journ. Bot. 22(10):912, 1935.

Abstract of a paper read before the Botanical Society of America.

Dykstra, T[heodore] P[eter]

A top-necrosis virus found in some apparently "healthy" potatoes. *Phytopathology* **25**(12):1115-1116, 1935.

The author gives a brief review of the work of several writers and says: "It is believed that the virus component found in apparently healthy tubers of some American varieties in addition to virus X, is the same as Bawden's virus B."

Cooperative studies of some European and American potato viroses. *Phytopathology* **26**(6):597-606, 1936.

Comparative studies of European and American viruses showed that X virus of European potatoes was similar to the so-called latent virus of "healthy" American potatoes. The Y virus, and the vein-banding virus (rugose mosaic complex minus the X component) caused banding of veins on tobacco leaves. These two viruses belong to the same group but are not identical. Paracrinkle of Europe does not resemble leaf-rolling mosaic or any other known American potato virus. Crinkle A of Europe is not the same as rugose mosaic in America. Virus C does not resemble any of the known American viruses.

Edgerton, C[laude] W[ilbur], & Tims, E. C.

Testing canes for disease resistances in Louisiana. *Proc. Fifth Congress Int. Soc. Sugar Cane Tech., Brisbane, Australia, 1935*:494-497, 1936.

This paper contains some discussion of methods for testing for mosaic.

Edwards, E. T.

Witches' broom: a new virus disease of Lucerne. *Journ. Austr. Inst. Agric. Sci.* **1**(1):31-32, 1935.

A description of this disease which is commonly known as spindle shoot, mistletoe, bunchy-top and kurrajong.

Ehrke, G.

Untersuchungen über die Eisenfleckigkeit der Kartoffel. (Investigations on "Eisenfleckigkeit" of the potato.) *Biochem Zeitung*, **278**(3-4):195-225, 1935.

In this rather extensive and comprehensive study the author gives the results of his observations and experiments.

Untersuchungen über die Stoffwechselvorgänge in Eisenfleckigen Kartoffeln. (Investigations on the metabolic processes in "Eisenfleckigen" potatoes.) *Angew Bot.* **17**(6):453-483, 1935.

Emmerez de Charmoy, D[onald] d'

La lutte contre la mosaïque de la canne à sucre à l'Île de la Réunion. (Control of sugar-cane mosaic in the island of Réunion.) *Rev. Agric. Maurice*, **83**:158-163, 1935.

Control by replacing infested areas with resistant varieties.

Esau, Katherine,

Initial localization and subsequent spread of curly top symptoms in the sugar beet. *Hilgardia* **9**(8): 397-431, 1935.

A very thorough study of the histology of diseased plants of various ages.

Esmarch, F.

Die Eisenfleckigkeit der Kartoffeln ("Eisenfleckigkeit" of potatoes.) *Kranke Pflanze* **12**(1): 7-10, 1935.

Contains information of "Eisenfleckigkeit" of potatoes with special reference to the investigations of Meyer-Hermann in Germany.

Esnault, O.

Les maladies dégénérescence de la pomme de terre. (Potato degeneration diseases), *Vie. Agric. Rur.* **24**(41): 235, 1935.

Popular.

Fawcett, G[eorge] L[orenzo]

Notas preliminares sobre una enfermedad del tabaco (Preliminary notes on a tobacco disease). *Rev. Indust. y Agric. de (Tucumán)* **12**: 5-17, 1921.

Fernandes, D. S.

Voorloopige mededeeling over dede oorzaak van de Zeefvaten-ziekte (phloemnecrose) bij de Liberiakoffie an have bestrijding (Preliminary note on the cause of the sieve-tube disease (phloem necrosis) of Liberian Coffee and its control. *Meded. Landbouwproefstat. Surinam* **2**, 12 p., 1928.

A physiological study. No causal organism was found.

Findlay, A. J.

Annual Report of the Department of Agriculture, (Zanzibar), 1934, 32 p., 1935.

This report includes notes on cassava mosaic.

Folsom, Donald

Potato virus diseases, in 1933. *Amer. Potato Journ.* **11**(9): 235-242, 1934.

Bibliography of recent literature.

Potato virus diseases in 1934. *Amer. Potato Journ.* **12**(11): 304-310, 1935.

A brief statement of recent literature and bibliography of recent publication.

& Bonde, Reiner

List of distinct potato viroses. *Amer. Potato Journ.* **13**(1): 14-16, 1936.

The authors give a list of 26 virus diseases which are apparently due to 26 distinct viruses. An excellent resumé.

Franklin, H[enry] J[ames]

False blossom, the most destructive cranberry disease. Mass. State Coll. Ext. Leaflet 154, 8 p., 1935.

Popular.

Fukushi, Teikichi

Multiplication of Virus in its Insect Vector. Proc. Imp. Acad. 11(7): 301-303, 1935.

The experiments were made with *Nephotettix apicalis* var. *cincticeps* which is a vector of the dwarf disease of rice. The author had previously demonstrated that virus was transmitted through the egg and three generations. A female was selected for this experiments. She transmitted the disease to 38 plants on which she had been confined for 24 hours on consecutive days and to at least 15 eggs. The progeny of these eggs transmitted the disease to 201 healthy plants. An egg weighs 0.06 milligrams. The author states that this transmission can hardly be explained without assuming a multiplication of the virus.

Galloway, L. D.

India: new plant diseases recorded in 1934. Int. Bull. Plant. Protect. 9(8): 176-178; (11): 268, 1935.

Among the new plant diseases reported during 1934 is a mosaic of *Elettaria cardamomum*.

Garbowski, L[udwik]

Choroby roślin użytkowych w okresie 1931-1933 r. Zestawienie notowań Zakładów Ochrony Roslin. (Diseases of useful plants in the period 1931-33. A summary of the observations of the Plant Protection Stations.) Rozn. Ochr. Rosl. Cz. A. (Choroby Roslin) 1931-33, 2: 406-580, 1935.

This report includes a list arranged by host of many plants affected with virus diseases.

Gardner, John S.

Tuber-indexing of potatoes made easy. Ohio Veg. Grow. Assoc. 19: 144-148, 1934.

Ghimpu, V.

Infinital mic in patologia vegetal: ultravirusurile fitopatogene. (The infinitely small in plant pathology: plant pathogenic ultraviruses). Viata Agric. 5, 10 p., 1935.

A semi-popular review.

Gigante, R[oberto]

La maculatura grigia interna dei tuberi di patata. Boll. R. Staz. Patol. Veg. (Roma) Firenze n. s. 14: 256-267, 1934.

II mosaic della Zucca. (Mosaic of vegetable marrow.) Boll. R. Staz. Pat. Veg. (Rome) 14(4): 503-530, 1934.

A description of the disease which is transmitted by *Aphis gossypii*.

 Prime ricerche sul comportamento di alcune varietà di patate italiane di fronte ai virus. (First reasearch on the behavior of some italian potato varieties to virus.) Boll. R. Stat. Pat. Veg. n. s. 15(4) : 533-547, 1935.

Preliminary report on his observations on the behavior of some potato varieties to virus diseases.

 Secondo contributo alla conoscenza della necrosi del cuore dei tuberi di patata (Second contribution to the knowledge of the heart necrosis of the potato tuber) Bol. R. Stat. Pat. Veg. 15(4) : 555-560, 1935.

The observations made by the author on experimental plots lead him to the conclusion that heart necrosis of the potato is hereditary; he also concludes that the experiments gave negative results in trying to find out if the disease was of the virus group.

Gilliat, F. C.

False blossom disease and insect pests of the cranberry. Ann. Rpt. Nova Scotia Fruit Grower Asso. 71 : 52-55, 1934.

Goidánich, G.

La leptonecrosi dei Ciliegi e degli Albicocchi. (Leptonecrosis of cherries and apricots.) Boll. R. Stat. Pat. Veg. (Rome) n. s. 14(4) : 531-540. 1934.

This disease presents resemblance to plum leptonecrosis. Although it is not definitely proved that it is a virus disease we decided to include it due to its similarity and interest to students on the subject.

Golding, F. D.

A probable vector of Cassava mosaic in Southern Nigeria. Trop. Agric. (Trinidad) 12(8) : 215, 1935.

Bemisia nigeriensis is the vector.

Bemisia nigeriensis Corb., a vector of cassava mosaic in Southern Nigeria. Trop. Agric. (Trinidad) 13(7) : 182-186, 1936.

Gould, N. K.

Hot water treatment of narcissus bulbs. Journ. Roy. Hort. Soc. 59(1) : 78-81, 1934.

This paper refers to the yellow stripe disease but the results are not definite.

 Stripe disease of daffodils. Journ. Royal Hort. Soc. 60(11) : 492-500, 1935.

A very complete discussion of this disease. A virus disease.

Green, D. E.

A suspected virus disease of Peonies new to Great Britain, Gard. Chron. 98(2543) : 213, 1935.

Probably the ringspot disease of France.

Green, R. G.

On the nature of filterable viruses. *Science* **82**:443-445, 1935.
The author concludes:

"From the very intensive investigations that have now been carried out on certain filterable viruses, their obligatively parasitic nature, their ultramicroscopic size and their intracellular specialization appear established. No characters have yet been discovered for filterable viruses that require an unique explanation. Their origin from visible microbes and their known characteristic properties are to be expected from our knowledge of the evolution of life under the conditions of parasitism."

Güssow, H[ans] T[heodor]

Seed potato certification. Canada Parliamentary Session 1924.
Select Standing Committee on Agriculture and Colonization, 1924.

A history of the inspection and certification work in Canada and statement of results.

Hansford, C[lifford] G[erald]

Sugar cane diseases in Uganda. *East African Agric. Journ.* **1**(1): 25-28, 1935.

A brief popular account is given of the local history, symptoms and control of sugar cane mosaic.

Hargreaves, E.

Rosette of *Arachis hypogea*. *Ann. Rpt. Dept. Agric. (Sierra Leone)* **1930**:27; **1931**:19; **1932**:19.

Entomological work: *Sierra Leone Dept. Agric. Rept.* **1933**:12-14, 1935.

The author reports that dark-veined type of groundnut mosaic (a form of rosette) is transmissible by *Aphis laburni*.

Harrison, A[rthur] L.

Bean mosaic menaces important crop. *Farm Research* **2**(1):1, 3, 1935.

Popular.

Mosaic of the refugee bean. *New York Agric. Expt. Sta. (Geneva) Bull.* **656**, 19 p., 1935.

The author gives a description of the common bean mosaic on this variety. The mosaics of red clover, alsike clover, white sweet clover, alfalfa, peas and black medick are caused by distinct viruses and some of them will attack the bean causing a yellow mosaic. The common mosaic can be transmitted by pea aphid, potato aphid, bean aphid, cucumber aphid, cabbage aphid, chenopodium aphid, *Macrosiphium ambrosia* and an unidentified species of mealy bug. "Altho many kinds of aphids will carry the disease from plant to plant, they are not very common in the bean fields." It is also transmitted in the seed. It can be controlled by the use of mosaic free seed, roguing and the use of immune varieties.

The physiology of bean mosaic. New York Agric. Expt. Sta. (Geneva) Tech. Bull. **235**, 48 p., 1935.

This bulletin is a record of extensive studies and contains much data. High temperature, formal-dehyde fumes and X-rays did not inactivate the virus in diseased seed. Transpiration was lower in diseased than healthy plants. Detached pods from diseased plants loose weight faster than those from healthy plants. Diseased plants are likely to be stunted and parts deformed. The symptom develops between 15 and 30 degrees C.

Transmission of bean mosaic. New York State Agric. Expt. Sta. (Geneva) Tech. Bull. **236**, 19 p., 1935.

The bean mosaic has not been found on any legumes, other than beans, in the vicinity of Geneva, New York, with the exception of sweet clover and then on only one plant. The viruses causing the mosaic diseases of red clover (*Trifolium pratense*), alsike clover (*T. hybridum*), black medick (*Medicago lupulina*) and white sweet clover (*Melilotus alba*) were transmitted by *Illinoia pisi* to *Phaseolus vulgaris* and caused a yellow bean mosaic. The disease was transmitted through the seeds but the amount of transmission was irregular.

Harrison, K. A.

Cranberry disease, Canada Dept. Agric. Bull. n. s. **180**: 27-30, 1935.

Harter, L[eonard] L[ee]

Mosaic of lima beans. Phytopathology **26**(2): 91, 1936.

Abstract of paper read before the 27th Annual meeting of the American Phytopathological Society. St. Louis, Mo., Dec. 1935. The disease is different from the mosaic of *Phaseolus vulgaris*.

Hartzell, Albert

A study on peach yellows and its insect vector. Cont. Boyce Thompson Inst., **7**: 183-207, 1935.

The author gives a very complete review of the subject and the results of his own work. He found that both nymphs and adults of *Macropsis trimaculata* transmit the disease.

Hedrick, Ulysses P.

Forty-fourth annual report for the fiscal year ended June 30, 1935. Division of Botany. Diseases of small fruits in Western New York. New York State Agric. Expt. Sta. (Geneva) Ann. Rpt. **45**: 30-31, 1936.

In this report the following subjects are briefly discussed: I. Control of virus diseases in black raspberries. II. Wild red raspberries as virus source. III. Mosaic in purple raspberries. IV. Delayed spring foliation of black raspberries caused by mosaics. V. "June yellows" in straw-berries.

Henderson, W. J.

Yellow dwarf, a virus disease of onions, and its control. Iowa Sta. Res. Bull. 188:209-255, 1935.

A description of this diseases which is very important. It is transmitted by *Aphis maidis*, *A. rumicis* and *Ehopalostiphum prunifoliae*. It was successfully transmitted by inoculation into *Narcissus tazetta*, *N. jonquilla* and *Allium ascalonicum*.

Henry, A. W.

Common potato diseases and their control. Alberta, College of Agric. Expt. Circ. 15, 1934.

Herbert, D. A.

Bitter pit in apples: the crushed cell theory. Phytopathology 12:489-491, 1922.

The author claims that the crushed cell theory does not give a satisfactory explanation.

Hiltner, L[orenzo]

Beiträge zur ernährung. Physiologie der kartoffel unter besonderen berücksichtigung des Abbauproblems. Rept. Blätt. Pflanzb. u. Pflanzensch. (Freising), 34:206-219, 1934.

Hirayama, S., & Yuasa, A.

Cytological study of tobacco mosaic I.—Ann. Phytopath. Soc. Japan 5(3):197-205, 1935.

The authors give in this paper the results of their observations and studies. As conclusion, they state that all tissue examined from tobacco plants affected with mosaic contained X bodies and other inclusions.

Ho, W. T. H., & Li, L. Y.

Preliminary notes on the virus diseases of some economic plants in Kwangtung Province. Lingnan Sci. Journ. 15(1):67, 68, 1936.

Account of several virus diseases occurring in Kwangtung, China.

Hoggan, Ismé A[ldyth]

Transmissibility by aphids of tobacco mosaic virus from different hosts. Journ. Agric. Res. 49(12):1135-1142, 1934.

Myzus pseudosolani, *M. persicae* and *Macrosiphum solanifolii* were tested to determine ability to transmit ordinary tobacco mosaic virus from 18 hosts plants. It was transmitted regularly from *Lycopersicon esculentum* and *L. pimpinellifolium*, and occasionally from others. *M. pseudosolani* was most efficient and *M. persicae* least efficient. A brief summary of Dr. Hoggans' work in Wisconsin.

& Johnson, James

A virus of crucifers and other hosts. Phytopathology 25(6):640-644, 1935.

A description of a disease that was transmissible to several crucifer, *Nicotiana tabacum*, *N. glutinosum*, *Lycopersicon pimpinellifolium* and *Spinacia oleracea*; *Myzus persicae* and *Brevicoryne brassicae* are vectors.

-----, & -----
 Behavior of ordinary tobacco mosaic virus in the soil. Journ.
 Agric. Res. **52**(4): 271-294, 1936.

Hollaender, A., & Duggar, B[enjamin] M[inge]

Irradiation of plant viruses and of microorganism with mono-
 chromatic light, III Resistance of the virus of typical tobacco
 mosaic and *Escherichia coli* to radiation from lambda 3000
 to lambda 2250 A. Proc. Nat. Acad. Sci. **22**: 19-24. 1936.

Hopkins, J[ohn] C[ollier] F[rederick]

Leaf spotting of tobacco caused by mosaic. Bull. **753**, 1929.
 (Also published in Rhodesia Agric. Journ. Issued by the au-
 thority of the Minister of Agric. of Rhodesia.)
 Popular.

 Field control of frencing in tobacco. Bull. **784**, 8 p., 1930.
 (Also published in Rhodesia Agric. Journ. Issued by the
 Minister of Agric. of Rhodesia.)

Popular. This is not a virus disease but has been confused with
 the mosaic of tobacco so often that it is included in the bibliography.

 Further notes on leaf curl of tobacco. Bull. **861**, 8 p., 1932.
 (Also published by authority of the Minister of Agriculture
 of Rhodesia.)

Popular.

 Mycological Notes: Seasonal Notes on Tobacco diseases. 8.
 The mosaic mystery. Bull. **942**, 1935. (Rhodesia Agric.
 Journ. **32**(2): 108-113, 1935.)

Popular.

 Annual Report of the Branch of Plant Pathology for the year
 ending 31st. Dec., 1934. Rhodesia Agric. Journ. **32**(6): 397-
 405, 1935.

Hungerford, Cha[rle]s W[illiam]

Curly top of vegetables in Idaho. Plant Disease Reporter **18**
 (14): 173-174, 1934.

The author states that in 1934 the virulence of curly top surpassed
 all records at the Idaho Experiment Station. Gives detail of losses
 due to the disease.

Hyde, R. R.

An interpretation of the filterable viruses. Amer. Journ. Hyg.
21(2): 472-481. 1935.

The author lists 20 virus diseases, including tobacco mosaic, which
 should be placed in one group because of the formation of inclusion
 bodies in all of them and because they will pass a filter. He be-
 lieves them to be living.

Ingram, J. W., & Summers, Eaton M.

Transmission of sugar cane mosaic by the rusty plum aphid, *Hysteroneura setariae*. Journ. Agric. Res. **52**(11): 879-887, 1936.

Until 1933 *Aphis maidis* had been the only proved vector of sugar cane mosaic, but preliminary experiments in that year showed that the rusty plum aphid (*Hysteroneura setariae*) was also capable of transmitting the disease. The authors gives the distribution of the insect and details of their experiments.

Jehle, R[obert] A[ndrew,] & Henberger, J. W.

Potato seed maintenance studies in Maryland. Maryland Agric. Expt. Sta. Bull. **361**: 345-356, 1934.

Jensen, Hj.

Ziekten van de tabak in Vorstenland. Proefstat. Vorstenland. Tabak Bull. **40**: 1-147, 1920.

Jensen James, H.

Studies on the origin of yellow viruses. Phytopathology **26**(3): 266-267, 1936.

The author obtained 51 strains of yellow mosaic from tobacco mosaic. This strains have arisen in a manner similar to mutations.

Notes on the present sugar cane-disease situation in Puerto Rico. Agric. Notes, Puerto Rico Agric. Expt. Sta. (Mayagüez) **68**: 1-8, 1936.

The results of a survey. Most of this paper is devoted to the mosaic situation.

Johnson E[dward] M[arshall], & Valleau, W[illiam] D[orney]

Are tobacco plants affected with mild mosaic susceptible to other strains of the virus. Phytopathology **26**(2): 96, 1936.

Abstract of paper read before the 27th meeting of the American Phytopathological Society, St. Louis, Mo., Dec., 1935. "The tests indicate that protection may be afforded individual cells or group of cells because they probably are completely occupied by the first virus, but the plant as a whole does not develop immunity."

An example of spread of veinbanding from potatoes to tobacco. Phytopathology, **25**(6): 650-652, 1935.

A demonstration that this disease is transmitted from potatoes to tobacco.

Johnson, Folke, & Jones, L[eon] K[ilby]

Virus diseases of peas. Phytopathology **26**(2): 96, 1935.

Abstract of paper read before 27th Annual meeting of the American Phytopathological Society, St. Louis, Mo., Dec., 1935. Common mosaic and severe mosaic of the common pea belong to the sprenkel and marmon types of Merkel. Cross inoculations demonstrated a large number of leguminous hosts. These diseases are rarely transmitted through the seeds.

Johnson, Frank H.

Cultural studies of the virus of tobacco mosaic. *Phytopathology* **25**(11):1035-1037, 1935.

A record of experiments for the culturing of the virus of tobacco mosaic. Many tests were made and only one gave positive results and this was not duplicated.

Johnson, James

Nomenclature of plant viruses. *Int. Bot. Cong. Proc.* **2**:193-195, 1935.

Tobacco streak, a virus disease. *Phytopathology* **26**(3):285-292, 1936.

This disease is due to a virus. The virus is relatively sensitive. It withstands aging less than 36 hours, the thermal death point is 53°C., and it is tolerant to dilutions of less than 1 to 30.

A tobacco hybrid useful for virus studies. *Amer. Journ. Bot.* **23**(1):40-46, 1936.

This is a cross between *Nicotiana tabacum* and *N. glutinosa*. It resembles *N. tabacum* in its morphological characters but appears to be completely sterile. The reaction to the virus of ordinary tobacco mosaic is that of *N. glutinosa*. The virus can be transmitted to the hybrid by aphids. The most favorable temperature is 22-24 degrees C. There is evidence of invasion to some extent through the stomata.

Jones, G. Howard

Egyptian plant diseases: a summary of research and control. Ministry of Agric. Egypt. Tech. & Scientific Ser. (Mycol. Sec. Bull. **146**. 45 p., 1935.

Although this publication is not devoted to virus diseases it contains records of ten of these diseases. These records are of value in connection with the study of geographical distribution.

Jones, L[eon] K[irby], & Baur, Karl E.

Mosaic and related diseases of raspberries in Washington. *Washington Agric. Expt. Sta. Bull.* **324**, 19 p., 1936.

A well illustrated popular publication.

-----, & Burnett, Grover

Virus diseases of greenhouse-grown tomatoes. *Bull. Washington Agric. Expt. Sta.* **308**, 36 p., 1935.

A semi-popular publication containing much important data.

Kaho, H.

Zur Physiologie der Kartoffel. I Über die Permeabilität des Knollengewebes der vitalen und der abbaukranken Kartoffeln. (Contribution to the physiology of the potato. I. On the permeability of the tuber tissue of sound and degenerate potatoes.) *Phytopath. Zeitschr.* **8**(2):157-164, 1935.

The author gives an account of his experiments in Estonia on potatoes suffering from degeneration in the form of mosaic, crinkle

and leaf roll. According to the experimental results it was showed that exosmosis was generally greater in the diseased than in the healthy tuber; that the cells of the diseased tubers have lower osmotic values than those of healthy ones and that the cells of diseased tubers are more permeable to water than those of healthy ones.

Zur Physiologie der Kartoffel. II. Ein Beitrag zur Diagnose abbaukranker Knollen. (On the physiology of the potato. II. A contribution to the diagnosis of degenerate tuber.) Phytopath. Zeitschr. 8(4): 323-335, 1935.

Continuation of previous work, cited above.

Das Verhalten der Eiweisstoffe und abbaukranker Kartoffelknollen gegen Salze. (The reaction of the albumins of healthy and degenerate potato tubers to salts.) Bull. Phytopath. Exp. Sta. Univ. Tartu 31, 22 p., 1935.

The author discusses and tabulates the results obtained in his experiments with healthy and degenerate (leaf roll, mosaic and crinkle) potato tubers as to the reaction to several salts and heat.

Kanngiesser,

Über netzpanaschierung bei *Oralis acetosella*. Naturwiss. Wach. 12, 1913.

Keeble, F.

Bitter pit. Nature, 98: 137-138, 1916.

Klapp, E. L.

Scheinabbau, modifikationen und viruskrankheit. (Zur neuregelung der kartoffel-erkennung). Der Züchter 6: 177-181, 1934.

Zusammenhänge von Standortseigenschaften, Viruserkrankung und Nachbauertrag der Kartoffel. (Connections between ecological properties, virus diseases and progeny yield of the potato.) Pflanzenbau 12(5): 163-191, 1935.

The present study is based on extensive experiments done by the writer in Germany. He observed the connection between the ecological influence and virus diseases and discusses his observations. He believes that virus diseases, inadequate ecological conditions and nutritional influences are important in the production of healthy seeds.

Klinkowski, M.

Die Bechholdsche Kupferprobe als diagnostisches Hilfsmittel zur Beurteilung des Gesundheitszustandes von Kartoffelknollen. (The Bechhold copper test as a diagnostic aid in the determination of the state of health of potato tubers.) Phytopath. Zeitschr. 8(5): 421-455, 1935.

Explanation of the method of Bechhold copper test for determining degeneration in potato tubers.

Knowlton, George F[ranklin]

The potato psyllid. Utah Agric. Expt. Sta. Leaflet **36**, 1934.

The beet leafhopper and curly-top. Utah Agric. Expt. Sta. Leaflet **8**, 3 p., 1934.
Popular.

Kock, G.

Wie erklärt sich der Abbau der kartoffeln und wie läst er sich oerhinden. Der Pioner, Heft. **5**, 3 p., 1934.

Die bedeutung der nicht-parasitäsen pflanzenkrankheiten für die landwirtschaftliche, Praxis. Ldw. Fachpresse f. d. Czecheslovakia **12**: 107-108, 1934.

-----, & **Greisenegger, K.**

Tatigkeitsbericht des Kartoffel-Fachausschussus über des Jahr 1934. (Report on the work of the Potato Expert Committee for the year 1934.) Neuheiten Pfl. Sch. **28**(1): 4-6, 1935.

In this report is added an unobserved form of mosaic-crinkle found in Petzenkirchen to the eight types of potatoes viruses previously recognized in Austria.

Köhler, E[rich]

Kartoffelabbau und viruskrankheiten. Mitt. Deut. Landw. Ges. **40**: 260-261, 1934. (Wiener Ldw. Ztg. **84**: 89, 1934.)

Mischinfektionen mit verschiedenen Stämmen des Ringmosaikvirus (X Virus-Gruppe.) der Kartoffel. (Untersuchungen über die Viruskrankheiten der Kartoffel. IV Mitteilung.) (Mixed infections with various strains of the ring mosaic virus (X virus group.) of the potato. (Investigations on the virus diseases of the potato. Note IV). Angew Bot. **17**(1): 60-74, 1935.

Continuation of previous work by the author. In the present paper he gives his observation in regard to the reaction in inoculations of viruses of different strains.

Übertragungsversuche mit dem virus der Lupinenbraune. (Transmission experiments with the Lupin browning virus.) Angew. Bot. **17**(5): 277-286, 1935.

The results of experimental studies. The disease appears to be identical with the sore shin of New Zealand. It was transmitted to *Lupinus angustifolius*, *L. luteus* and to Samsun tobacco.

Über Umweltnachwirkungen bei einer vegetativ vermehrten Pflanze (Kartoffel.) Angew Bot. **17**(5): 288-302, 1935.

Zur charakterisierung des ringmosaikvirus (X virus) der kartoffel. (The characteristics of the ring-mosaic virus (X virus) of potato. Int. Bot. Cong. Proc. **2**: 197-198, 1935.

Über die Variabilität des Ring mosaikvirus (X virus) der Kartoffel. (The variability of the virus of ring-mosaic (X virus) of potato.) Die Naturw. **23**(49): 828-829, 1935.

The author gives his observations and experimental evidence. He confirms those of J. Johnson and Koch.

Die Viruskkrankheiten der Kartoffel. (The virus diseases of potato.) Biol. Reichs. für Land-und Forst. Flugblatt **42**, 4 p., 1935.

Popular account and discussion.

Erfahrung beim feldmässigen Anbau von Künstlich blattrollinfizierten Kartoffeln. (Sorte Kl.-Sp. Wohltmann.) (Untersuchungen über die Viruskkrankheiten der Kartoffel. V. Mitteilung.) ond. Arb. Biol. Reich. für Land-und Forst. **21**(4): 517-529, 1935.

Account of Experimental results.

-----, & Hey, A.

Untersuchungen an Kartoffelproben über die Beziehungen zwischen knollenpotential und Virusleefall. (Investigation on potato samples on the relations between tuber potential and virus infection) Zentbl. Bakt. 2 Abt., **91**(11-15): 256-267, 1935.

The authors used tubers of different regions and found that when the tubers were cut in half and one part used for potential measurements and the other for the determination of virus infections, there was a correlation towards the definite end. The results are discussed.

Viruskkrankheiten (Virus disease) Kranke Pflanze, **12**: (7-8): 109-112, 1935.

A semipopular account of recent discoveries with special reference to cultivated plants.

Fortgeführte Untersuchungen über den kartoffelabbau. (Continued investigations on potato degeneration.) Landw. Jb. **80**(3): 379-408, 1936.

This rather extensive comprehensive study is a contribution of previous investigations on the etiology of potato degeneration made by the author. He study different viruses and their behavior on different potato varieties and tobacco.

Koratshevsky, I.

(New data on the properties of the tomato mosaic virus.) Trans. Lenin Acad. Agric. Sciences, p. 82-91, 1936.

Paper read before the First Virological Conference. March 7-11, 1935. This is the leaf-fern virus No. 1, of the tobacco mosaic group. A discussion of reactions to chemicals.

The stolbur disease of plants. Trans. Lenin Acad. Agric. Sciences, **1936**: 99-111, 1936.

Paper read before the First Virological Conference, March 7-11, 1935. (Eng. summary.) This disease attacks *Atropa belladonna*, *Datura stramonium*, *Convolvulus arvensis* and *Nicotiana tabacum*. Probably transmitted by *Thrips* sp. The disease is very severe. Methods of control are given.

Kozlowski, Antoni

Little leaf or rosette of fruit trees in California. Phytopathology **25**(2): 275-278, 1935.

A description of the disease which appears to be an exanthema.

Kunkel, Louis] O[tto]

Recent advances in studies on plant virus diseases. Rept. Soc. for Prot. of plants. **1932-34**: 23-22, 1934.

A review of studies on variant strains of tobacco mosaic virus and insect vectors.

Immunological studies on the three peach diseases, yellows, rosette and little peach. Phytopathology **26**(3): 201-219, 1936.

Descriptions are given of these diseases. Little peach and yellows do not give immunity against rosette, but each gives immunity against the other. Peach yellows and little peach are believed to be related but rosette is believed to be different.

Larue, P.

Études et vues nouvelles sur la chlorose de la vigne. Progr. Agr. et Vitic. **105**(16): 378-380, 1936.

Leach, Julian] Gilbert]

Insects in relation to plant diseases. Bot. Rev. **1**(11): 448-466, 1935.

Two pages of this paper are devoted to a brief discussion of insects and virus diseases.

Lees, Alan] Henry]

Progress report on big bud and reversion of black currant. Univ. Bristol Ann. Rpt. Agric. and Hort. Res. Station **1923**: 69-72, 1923.

Lefevre, P.

Quelques considerations sur la "mosaïque du manioc" (Some considerations on cassava mosaic.) Bull. Agric. Congo Belge **26**(4): 442-447, 1935.

According to the author cassava mosaic was first described in 1895 by Dammer from East Africa. The author describes the behavior of the disease and its reaction to wood ashes and stable manure. He also states that bitter types of cassava are more susceptible than the sweet ones. The insect vector for cassava mosaic is given here as *Bemisia gossypiperda* var. *mosaicivecta*.

Lehman, S[amuel] G[eorge]

Soil contamination as a factor in crop infestation of tobacco mosaic. Journ. Elisha Mitchell Sci. Soc. **50**(1-2): 44-45, 1934.

This is an abstract of a paper presented before the North Carolina Academy of Sciences, May 4-5, 1934.

Lemmon, Paul

Comparative studies on Metabolism of healthy and mosaic-infected tobacco leaves, Respiration studies. Amer. Journ. of Bot. **22**(10): 912, 1935.

Abstract of a paper read before the Botanical Society of America.

List, George M.

Psyllid yellows of potatoes, with a preliminary report on the control of the insect *Paratriza cockerelli* Sule. Journ. Colorado-Wyoming Acad. Sci. **1**: 74-75, 1934.

Loughnane, J[ames] B., & Clinch, Phyllis

Composition of interveinal mosaic of potatoes. Nature **135** (3420): 833, 1935.

This disease is a complex of two viruses.

Lounsbury, C. P.

Tobacco wilt in the Kat River Valley. Agric. Journ. of Cape of Good Hope, **28**: 784-803, 1906.

Longley, L. E.

Flower in "broken" or mosaic tulips. Proc. Amer. Soc. Hort. Sci. **33**: 664-667, 1936.

Ludewig Karl,

Ueber die kroepoek-krankheit des Tabaks in Kamerun. Ber. Deutsch. Bit. Gesell **31**: 536-543, 1913.

Luthra, J. C., & Satter, A.

Some observations on the mosaic disease of sugar cane in the Punjab. Indian Journ. Agric. Sci. **5**(6): 649-662, 1935.

Description of symptoms of the disease in the Punjab District of India. Discussion on the relative resistance of different varieties.

Magee, C[harles] J. P[atrick]

Spotted disease of lettuce and potatoes. Agric. Gaz. New South Wales **47**(2): 99-100, 118, 1936.

The virus is transmitted by *Thrips tabaci* and *Frankliniella insularis*.

Bunchy top disease of bananas. Rehabilitation of the banana industry in New South Wales. Journ. Austral. Inst. Agric. Sci. **2**(1): 13-16, 1936.

Mahoney, C. H.

Seed transmission of mosaic in inbred lines of muskmelons (*Cucumis melo* L.) Proc. Amer. Soc. Hort. Sci. 1934, **32**: 477-480, 1935.

Forty-eight inbred progenies were studied and six were found to show seed transmission. Three selections did not transmit the disease through the seeds.

Breeding snap beans for mosaic resistance. A progress report. Proc. Amer. Hort. Sci. 1934, **32**: 483-484, 1935.

A study on selection of varieties of *Phaseolus vulgaris*.

Malcolm, D. H.

Virus diseases of tobacco. Tasmanian Journ. Agric. **7**(2): 57-60, 1936.

Manil P.

L'etude sérologique des maladies à virus des végétaux. (The serological study of plant virus diseases.) Comp. Rend. Deuxième Congr. Sci. Bruxelles p. 998-1004, 1935.

Address made by the author at Brussels in June 1935. He reviews and discusses the most recent advances in the serological study of filterable plant viruses.

Manns, T[homas] F[ranklin]

Peach yellows and little peach studies. Phytopathology **26**(2): 100, 1936.

Abstract of paper read before the 27th meeting of the American Phytopathological Society, St. Louis, Mo., Dec., 1935. The author gives the results of extensive studies. *Macropsis trimaculata* is widely distributed and the only vector found.

Marchionatto, Juan B., & Millán, R.

Certificación de la "semilla" de papa. (Potato seed certification) Bol. Minist. Agric. Argentina **36**(4): 301-312, 1934.

As an introduction, the authors give an account of quarantine regulations for the exclusion of potato diseases, with special reference to those of virus origin in Brazil, Uruguay and Argentine where virus diseases of potato are assuming great importance. Then quarantine provisions for Argentine are inserted.

Martin, F.

La dégénérescence de la Canne à sucre. (Degeneration of sugar cane.) Bull. Asso. Chim. Sucrerie & Distill. France & Colon, **52**: 643-661, 1935.

The author believes that degeneration of cane is due to the use of terminal slips for planting.

Martin, J[oseph] P[olkinghorne]

Sugar cane disease control in Hawaii through the modification of Agricultural practices. Proc. Fifth Congress of the Int. Soc. Sugar Cane Tech., Brisbane, Australia, 1935: 205-210, 1936.

This paper includes discussions of chlorotic streak and mosaic. The author recommends selection and roguing.

-----, & Carpenter C[larence] W[illard]

Testing cane varieties for diseases resistance in Hawaii. Proc. Fifth Congress Int. Soc. Sugar Cane Tech., 1935: 519-521, 1936.

This paper contains a brief discussion of mosaic.

Chlorotic streak disease of sugar cane. Proc. Fifth Congress Int. Soc. Sugar-cane Tech., Brisbane, Australia, 1935: 823-828, 1936.

A review of our knowledge of this disease and the recent studies by the author.

Martyn, E[ldred] B[ridgeman]

Report of the Botanical Division for the year 1932. Divisional Reports of Agric. British Guiana for the year 1932: 117-121, 1934.

The author reports two types of petunia mosaic A & B. The latter read: "The very slow spread of mosaic on D. 625 sugar canes in British Guiana, where no control is practised and the infected fields have been continued to the fourth and fifth ratoons, in spite of which good yields have been maintained, indicates that this variety is definitely resistant."

"Liberian coffee from Demerara was affected with phloem necrosis (*Phytophthora leptocarponum*); until recently, only isolated bushes were attacked in British Guiana, but in 1932 a more extensive outbreak occurred in the North West Districts."

Matsumoto, Takashi

(Differentiation of the two petunia diseases by means of serological, cytological and inoculation experiments.) Botany and Zoology. 3(5): 893-898, 1935.

The author reports two types of petunia mosaic A & B. The latter is the same as ordinary tobacco mosaic. A cannot be transmitted by inoculation with sap but can be transmitted by inserting small pieces of diseased leaves in the growing stems. They differ in serological reactions. A does not have inclusion bodies. The symptoms are very similar except that A caused a more pronounced symptom of "clearing of veins" in the early stages.

-----, & Hirane, Seichi

Immological studies of mosaic diseases. V. Microserological tests as means of detecting the virus in a small area of mosaic tobacco plants. Journ. Soc. Trop. Agric. 7: 346-350, 1935.

The results of very delicate micro-serological tests which are somewhat different from previous results.

(Serological Analysis of the infective agents causing tobacco mosaic with malformed flowers.) Trans. Nat. Hist. Soc. of Formosa 26: 258-261, 1936.

In Japanese. A resumé in English reads: "In the course of the study of virus diseases the author found some peculiar mosaic to-

bacco plants bearing strikingly malformed flowers. It has been confirmed by the serological methods, particularly by "precipitin absorption", that the disease under consideration is the composite one due to the virus complex, i.e. common tobacco mosaic and potato mosaic. The disease is therefore identical or very closely related to the "tomato streak" which is caused by the combination of tomato mosaic and potato mosaic viruses, since the tobacco mosaic is proved to be identical with the tomato virus. The above relation has been confirmed by inoculation."

Matz, Julius

Relative infectivity of mosaic virus in the different parts of infected sugar-cane, Proc. Fifth Congress Int. Soc. Sugar cane Tech., Brisbane, Australia, 799-803, 1936.

The work recorded in this paper shows that the virus is not distributed equally throughout the plant and that all parts of the plant are not equally susceptible.

McClean, A[lan] P[ercy] D[ouglas.] & Halse, R. H.

Streak disease of sugar cane; its economic importance in S. Africa. Proc. South African Sugar Tech. Asso. 1936.

The authors give a brief history of this disease and the results of very careful studies to determine the importance of this disease.

Streak disease of sugar cane. Proc. Fifth Congress Int. Soc. Sugar Cane Tech. Brisbane, Australia, p. 812-822, 1936.

This paper contains a brief history of the disease, data on distribution, description and a very thorough discussion of the author's experimental studies.

The bunchy-top disease of the tomato. Host range of the bunchy-top virus. Farming in South Africa. 10(112):302-303, 1935.

The disease has been transmitted to *Solanum aculeatissimum*, *S. aculeastrum*, *S. duplosinuatum*, *S. incanum*, *S. panduraciforme*, *S. nigrum*, *S. sodomaeum*, *Nicandra physaloides*, *Physalis angulata*, *P. viscosa*, *Solanum tuberosum*, *S. melongena* and *P. peruviana*. The symptoms were masked in *P. angulata* and *S. nigrum*.

Further investigations on the bunchy-top disease of tomatoes. Dept. of Agric. Union of S. Africa. Sci. Bull. 139, 36 p., 1935.

The author gives a list of plants to which the disease was transmitted and a special study of the reactions of some of them. The virulence of the virus increases as a result of passage through tobacco but not through other Solanaceae. The author also gives the results of temperature studies and mixing of the virus with alcohol.

McDonald, I. M.

Tests of curly-top resistant beets. Facts About Sugar **25(6)**: 212-214, 1935.

A study to determine resistant strains.

McGeorge, W. T.

Pahala blight and a comparison with other forms of chlorosis. Hawaiian Planters' Record **30(2)**: 293-328, 1926.

This does not refer to virus diseases but is of interest in this connection.

McKinney, H[arold] H[all]

The antigenic properties of plant viruses. Science **82(2125)**: 276-277, 1935.

The author agrees with Chester's conclusions in general but takes some exceptions to the interpretations.

The inhibiting influence of a virus on one of its mutants. Science **82(2133)**: 463-464, 1935.

The author believes the yellow mosaic in a mutant of the common mosaic of that host. He discusses the immunization of plants by the use of viruses and concludes that a relatively large amount of the common mosaic virus prevents the establishment of the yellow mosaic virus.

Reaction of wheat varieties, selections and hybrids to mosaic and mosaic-rosette. U. S. Dept. Agric. Misc. mimeographed publication, 1935.

Evidence of virus mutation in the common mosaic of tobacco. Journ. Agric. Res. **51(11)**: 951-981, 1935.

After discussing fully his experiments the author concludes that in view of the mutable nature of certain plant viruses, it is possible that viruses may be eventually isolated which will have both a prophylactic and curative effect and yet will not survive indefinitely in an active form in the plant.

McRae, W[illiam]

Report of the Imperial Mycologist. Scient. Rpts. Imper. Inst. Agric. Pusa (India) **1931-32**: 122-140, 1933.

This report includes a test of 25 varieties of sugar cane to determine resistance to mosaic.

Scheme for research in mosaic. Scient. Rpt. of the Imper. Inst. of Agric. Res. Pusa (India) **1932-33**; 1934.

McWhorter, Frank P[aden]

Some diseases of ornamentals in Oregon. Plant Dis. Reporter **19(2)**: 18, 1935.

Some 20 per cent of the Calla lily (*Zantedeschia ethiopica*) plants in a Portland greenhouse are reported to be suffering from a mosaic presenting every characteristic of a typical virus disease.

-----, & Milbrath, J. A.

The interpretation of Oregon tip blight on a basis of causal viruses. *Phytopathology* (Abstract) **25**(9): 897-898, 1935.

The properties and interpretation of tulip-breaking viruses. *Phytopathology* (Abstract) **25**(9): 898, 1935.

Metzger, C. H.

Growing potatoes in Colorado. *Colorado Agric. Expt. Sta. Bull.* **412**, 1934.

Michailova, P. V.

(The pathological changes of generative tissues of the tomato plant affected of woodiness of the fruit.) *Trans. Lenin Acad. Agric. Science*, **1936**: 92-98, 1936.

Paper read before the First Virological Conference, March 7-11, 1935. A study of the histology of plants with this disease.

Pathologico-anatomical changes in the tomato incident to development of woodiness of the fruit. *Phytopathology* **25**(6): 539-558, 1935.

These studies were made in the Laboratory of Virus Diseases, Ukrainian Inst. of Plant Protection, U.S.S.R., Kharkow, Sozsolehos House. That is probable due to a virus. Was reported from Crimea and Australia in 1933. The author gives a very thorough discussion of the subject.

Miles, A. C.

Report of the Department of Agriculture, Gold Coast, for the year 1934-35. 17 p., 1935.

This report contains very interesting notes on the breeding work and the result obtained with resistant varieties of cassava to mosaic disease. It contains also notes on tobacco and sugar cane virus diseases.

Moore, E[nid] S[tella], & Wager, V. A.

Kromnek: A serious tomato disease. *Farming in South Africa*. Reprint **51**, 1934.

A popular discussion.

Mottet, S[éraphin] J[oseph]

La dégénérescence de la pomme de terre. (Degeneration of potatoes.) *Journ. Soc. National, Hort. France* **23**: 263-268, 1922.

The author says that virus diseases are among several causes.

Mouraskinsky, K. E.

(New diseases of cultivated plants in western Siberia.) Trans. Omst. Inst. Agric. 1(6): 3-30, 1935.

This report includes much data on some virus diseases specially on wheat and rye new to the area.

Muncie, J[esse] H[oward]

History and development of potato disease. Ohio Veg. Grow. Asso. 19: 128-139, 1934.

Yellow dwarf disease of potatoes. Michigan Agric. Expt. Sta. Spec. Bull. 260, 18 p., 1935.

This virus disease is transmitted by *Macrosiphum solanifolii*.

Mungomery, R. W., & Bell, Arthur F[rank]

The spread of Fiji disease by insects. Cane Growers' Quarterly Bull. (Bureau of Sugar Expt. Station, Queensland), 1(1): 20-23, 1933.

Popular.

Murphy, Paul A[loysius]

Identity and spread of some potato viruses of the mosaic group. Int. Bot. Cong. Proc. 2: 198-201, 1935.

Noble, R[obert] J[jackson]

Woodiness of passion fruit, Trop. Agric. (Ceylon) 72(1): 48-49, 1929.

A review of a paper in Agric. Gaz. N. S. Wales, 39(9): 691-693, 1928.

Filterable viruses. Report of the Australian and New Zealand Association for the Advancement of Science, Vol. XXI, 1933.

"It is considered that the peculiar symptoms of virus diseases in plants may be due to the close association between the virus particles and the constituents of the cells, and that the diseases are caused by living organisms, although this has not been demonstrated conclusively."

"Virus disease symptoms may be masked by changes in air temperature and light intensity. This apparent recovery of the affected plants may explain why so many specifics have been offered for the elimination of these diseases. Properly conducted tests have demonstrated that these preparations are not of any value."

"Although a plant virus may affect many unrelated plants with production of symptoms, it is of possible greater significance that a virus may also be harboured by a plant without any evidence of symptoms."

"These virus carriers should be examined much more closely as they may help to provide further information on the nature of these diseases, thus leading possibly to the development of new control measures; the carriers also may be potential sources for the develop-

ment of even more serious virus infections when circumstance favor the transfer of the hidden virus alone or in combination with other plant viruses to other plants."

Some aspects of problems associated with the preservation of health in plant. Presidential Address, Reprint from the Journal and Proc. of the Royal Society of New South Wales. 69: 1-34, 1935.

A part of this paper is devoted to a general discussion of virus diseases.

Australia: Notes on plant diseases recorded in New South Wales for the year ending 30th June, 1934. Int. Bull. Plant. Prot. 9(1): 2-5, 1935.

This report includes notes of a new record of streak disease in tomato and a rosette disease of sweet potatoes.

Australia: Notes on plant diseases recorded in New South Wales for the year ending 30th. June, 1935. Int. Bull. Plant Prot. 9(12): 270-273, 1935.

In this report a brief note is included recording the occurrence of tomato spotted wilt virus in dahlias and *Schizanthus*.

Nolla, J[osé] A[ntonio] B[ernabé]

Studies on disease resistance. I—A tobacco resistant to ordinary tobacco mosaic. Journ. Agric. Univ. Puerto Rico 19(1): 29-49, 1935.

The *Ambalema* tobacco is resistant to tobacco mosaic but developed symptoms which are described. It is also resistant to yellow tobacco mosaic and celery mosaic. It is very susceptible to cucumber mosaic, yellow cucumber mosaic, potato ring spot, Wingard's tobacco ring spot and spot necrosis. It is less susceptible to the mottle and vein-banding viruses.

North, D[avid] S[utherland], & Barber, E. G.

Fiji disease and varieties. Proc. Fifth Congress, Int. Soc. Sugar Cane Tech., Brisbane, Australia, 1935: 498-505, 1936.

Ogilvie, L[awrence]

Notes on lilies. Agric. Bull. Bermuda Dept. Agric. 6(4): 4-5, 1927.

Report of inspection of *Lilium longiflorum* var. *eximium* for mosaic, inoculations and the results.

An important virus disease of *Lilium longiflorum* and its varieties. Nature 119(2997): 528, 1927.

A report of yellow flat on *Lilium longiflorum*, *L. giganteum* (*L. longiflorum* var. *takestima*), *L. formosum* (*L. longiflorum* var. *insulare*), *L. banisii* (*L. longiflorum* var. *eximium*.) Transmitted by *Aphis lili*.

The Bermuda Easter Lily. Royal Bot. Soc. London Quart. Summary **39**: 4-6, 1929.

A popular discussion of the history of the host and the mosaic disease.

Spotted wilt of tomatoes and its control. Annual Report of the Agric. & Hort. Res. Station, **1934**: 170-174, 1935.

This paper gives a valuable list of hosts of this disease and recommendations for its control. The thrips should be controlled by nicotine fumigation and spraying, diseased plants should be removed and workers should wash their hands with soap and water after touching diseased plants.

Oortwijn, Botjes J. G.

De stand van het immuniteitsvraagstuk bij viruziekten van de planten. (The status of the immunity problem in virus diseases of plants.) Tijdschr. Pl. Ziekt. **42**(1): 1-9, 1936.

Based on the current studies in Europe and United States the author discusses the problem of immunity in relation to virus diseases of plants.

Orton, C[layton] R[oberts], & Henry, W. D.

An internal necrosis of bean seeds. Phytopathology **25**(7): 726-728, 1935.

A brief description of a disease that may be due to a virus.

Otero, José I[dilio], & Cook, Melville T[hurston]

Partial bibliography of virus diseases of plants. Journ. Agric. Univ. Puerto Rico **18**(1-2): 1-410, 1934.

A bibliography of more than 3,000 papers.

-----, & -----

First supplement to partial bibliography of virus diseases of plants. Journ. Agric. Univ. Puerto Rico **19**(2): 129-313, 1935.

This publication contains a large number of titles and indexes to the original and supplement mentioned above.

Pal, B. P., & Nath, P.

Phyllody: a possible virus disease of *Sesamum*. Indian Journ. Agric. Sci. **5**(4): 517-522, 1935.

The authors report this new disease on *Sesamum indicum* at Pusa. The evidence so far is that it is caused by a virus and is characterized by the bearing of the affected plants of flowers in which all the floral members except the stamens are transformed into leaf-like organs or show a marked tendency to become leafy. The symptoms of the disease are well described.

Palm, B[jorn] T[orvald]

Pricksjukans problem. Ennyorientering. (The bitter pit problem. A reorientation.) Teidem pages 11, 1924.

The author suggests that this disease is due to a virus. This is the earliest suggestion that this disease is due to a virus that has come to our attention.

Applets princksjuka. En cytologisk undersökning. (Bitter pit in apples. A cytological study.) Sv. pomol. Foren Arsskrift, 15 p., 1915.

Pape, H[einrich]

Über eine mosaikkrankheit der Kohlrübe (On a mosaic disease of the Swede) Dtsch. Landbw. Pr. **62**(26): 319-320, 1935.

A description and results of experiments. The virus is transmitted by *Lygus pratensis*.

Park, M[alcolm]

Report on the work of the Mycological Division. Adm. Rept. Dir. Agric. (Ceylon) **1934**: D124-D131, 1935.

In this report are included notes on virus diseases on *Capsicum annum*, *Solanum nigrum* and *S. laeve*; also bunchy top of plantains.

Pascalet, M.

Note sur mosaïque du manioc (lepre du manioc) au Cameroun et au Nord du Gabon, Niet gepubliceerd rapport, 1931.

Pemberton, C. E.

The insect vectors of virus diseases of sugar cane. Proc. Fifth Congress Int. Soc. Sugar Cane Tech. Brisbane, Australia, p. 118-120, 1936.

A very brief review with list of species of *Perkinsiella*.

Peters, L., & Schwartz, M.

Krankheiten und beschädigen des tabaks. Mitt. Biol. Land- und, Forswirtsch. Berlin 128 pp., 1912.

Petherbridge, F. R., & Stirrup, H. H.

Pests and diseases of the sugar-beet. Bull. Minist. Agric. London, 58 p., 1935.

The virus diseases discussed includes mosaic, yellows and crinkle, which is done to some extent.

Petri, L[ionelo]

Deuterophoma tracheiphila e malattie da virus degli agrumi. (*Deuterophoma tracheiphila* and virus diseases of Citrus.) R. C. Accad. Lincei **21**(5): 301-306, 1935.

The author discusses a number of points of Attanasoff's interpretation of "mal seco" of lemon and other Citrus as a virus disease. He gives the results in the control of the disease and the relation of *Deuterophoma tracheiphila* to it.

Pfankuch, E.

Zur biochemie des kartoffelabbanes. I. Nachrichtenbl. Deut. Pflanzenschutzld, **14**: 38, 1934.

Zur Biochemie des Kartoffelabbaues. II. Mitteilung: Ascorbinsäure, Glutathion und Zucker. (A contribution to the biochemistry of potato degeneration. Note III Ascorbic acid, glutathion and sugar.) Biochem. Zeitung **279**(1-2): 115-130, 1935.

Studies made with leaf roll virus and the named reagents. Account of results obtained.

Pierce, W. A., & Walter, J. C.

New mosaic resistance refugee bean is developed. Canning Age **15**(2): 83-84, 1934.

Popular.

Pierce, W[alter] H[oward]

The inheritance of resistance to common bean mosaic in field and garden beans. Phytopathology **25**(9): 875-883, 1935.

Account and discussion of the experimental results obtained in varietal resistance to common bean mosaic.

Pirone, P. P.

Spotted wilt of tomatoes and peppers in New York. Plant Disease Reporter **19**(15): 244, 1935.

A record of the disease on *Lycopersicon esculentum* and *Capsicum annuum*.

Pivovarova, R., & Gorelik, I.

Tests of Rouzinov's and other methods for estimating the soundness of potato tubers. Trans. Lenin Acad. Agric. Sciences. **1936**: 51-58, 1936.

Paper read before the First Virological Conference, March 7-11, 1935. The authors reject Rouzinov's method and reports progress with another.

Plank, J. E. van der

Internal brown fleck of potatoes. Farming in South Africa. **8**: 383-384, 1933.

Porter, D. R.

Insect transmission, host range, and field spread of potato calico. Hilgardia **9**(8): 383-394, 1935.

A discussion of experimental work. *Macrosiphum solanifolii* (M. gei) is a vector. The disease was transmitted by mechanical inoculation to *Lycopersicon esculentum*, *Capsicum annuum*, *Datura stramonium* and *Petunia* sp.

Price, W[illiam] C[onway]

Acquired immunity from cucumber mosaic in Zinnia. Phytopathology **25**(8): 776-789, 1935.

Cucumber mosaic yellow strain No. 6 and tobacco mosaic 302 A attacked *Zinnia elegans*. Plants that became mottled with four strains of cucumber mosaic virus were immune to No. 6 but not to 302 A. Plants that became mottled as a result of tobacco mosaic or aucuba

mosaic viruses were immune to 302 A, but susceptible to No. 6. Plant infected with tobacco ring spot, yellow ring spot or severe etch viruses were not immune to either No. 6 or No. 302 A.

Classification of southern celery-mosaic virus. Phytopathology 25(10): 947-954, 1935.

The author summarizes his work as follows: "Infection of zinnia plant with southern-celery mosaic virus induces in them a specific immunity from a yellow strain of cucumber-mosaic virus (strain 6). Celery-mosaic virus and cucumber-mosaic virus, therefore, are closely related immunologically and it is believed, should be classified as strains of the same virus. Corroborative evidence is found in the fact that the symptoms produced by celery-mosaic virus in *Zea Mays*, L., *Commelina communis* L., and *Vigna sinensis* L. Endl. are similar to those produced by ordinary cucumber-mosaic virus in the same hosts."

Virus concentration in relation to acquired immunity from tobacco ring spot. Science (Abstract) 32(2139): 621-622, 1935.

This is an abstract of a paper presented at the autumn meeting of the National Academy of Science.

Virus concentration in relation to acquired immunity from tobacco ring spot. Phytopathology 26(6): 503-529, 1936.

This is a continuation of previous work by the author. He found (1) that ring spot virus multiplied in tobacco plants that had recovered from the disease, (2) leaves of diseased plants contained 5 to 10 times as much virus as leaves from plants that had recovered, (3) basal parts of leaves from plant that had recovered contained less virus than the apical parts, (4) fully recovered leaves contained more virus than healthy appearing parts of partly recovered leaves, (5) the virus content of recovered leaves was not increased by re-inoculation, (6) the roots of recovered plants contained less virus than the roots of plants that had not recovered, (7) no essential difference in virus in stems of plants that had recovered and those that had not recovered, (8) recovered plants grown through 10 generations from cuttings contained less virus than diseased plants.

Specificity of acquired immunity from tobacco-ring-spot diseases. Phytopathology 26(7): 665-675, 1936.

Pullen, A. R., & Wassermann, J.

Some observations on potato "degeneration" in South Africa. South African Journ. Sci. 32: 271-279, 1935.

Account of a survey of potato virus diseases of occurrence in South Africa viz. Apical leaf roll, giant hill, spindling sprout, spindle tuber, and yellows (mosaic).

Putman, D. F.

The analysis of a complex mosaic of President potato. *Sci. Agric. (Abstract)* 15(6):437, 1935.

Quanjer, H[endrik] M[arius], & Gaumann, E.

Versuche über den Einfluss des Klimas auf den Gesundheitszustand der Kartoffel-pflanze. (Experiments on the influence of climate on the state of health of the potato plants.) *Phytopath. Zeitschr.* 8(4):307-321, 1935.

Studies in potato ecology. The authors give the results of their observations in Switzerland to determine the influence of altitude on the incidence, virulence and course of the anecrotic type of mosaic disease.

-----, & **Thung, H. M.**

Classification of potato viruses and tobacco-viroses in Java. *Int. Bot. Cong. Proc.* 2:199, 202-203, 1935.

Historique des recherches sur la jaunisse et la mosaïque de la betterave (The development of the research into the yellow-spot and mosaic disease of the beet) *Publ. Inst. Belge Amcl. Betterave* 4(2):23-33, 1936.

De vergelings ziekte en de mosaikziekte van suiker-en vovderbeiten. I. Geschiedenis van het onderzoek over de vergelingsziekte en de mosaiekziekte van de biet. (Virus yellows and mosaic disease of sugar-and fodder beet. I. History of the investigations on Virus yellows and mosaic.) *Inst. Phytopath. Lab. Mycol. en Aardappelonderzoek. Wageningen, Holland, Meded.* 77:45-54, 1936.

Review of the work done by other workers giving the symptoms of the diseases.

-----, & **Roland, G.**

De vergelingsziekte au de mosaikkziekte van de suiker—en volderbiet. I-II. I. Geschiedenis van het onderzoek over de vergelingsziekte en de mozaiekziekte van de biet. (History of the investigation on virus yellows and mosaic. (Netherlands). II. Onderzoek van de vergelingsziekte van de biet, met enkele opmerkingen over de mozaieksiekte. (Investigation on virus yellows and some remarks on mosaic, Belgium.) *Tijdschr. Plantenz.* 42(3):45-70, 1936.

Rafay, S. A.

Physical properties of sugar-cane mosaic virus. *Indian Journ. Agric. Sci.* 5(6):663-670, 1935.

Account of inoculations made of sugar cane virus and its response to several reagents.

Ragallar, Franz

Der Abbau. Eine entwicklungsgeschnechtliche studie zum senilitäts-und Fortpflanzungsproblem. 85 p. G. Fischer, Jena†
Adv. on front cover *Bot. Cent.* 26(168) H. 1/2, 1934.

Rands, R[obert] D[elafield], Abbott, E[rnest] V[ictor], & Summers E[aton] M.

Disease resistance tests on sugar cane seedlings and initial selection procedure in the Southern United States. Proc. Fifth Congress Int. Soc. Sugar Cane Tech., Brisbane, Australia. p. 484-492, 1936.

This paper contains a discussion of method for testing for mosaic reactions.

Rangaswami, S., & Sreenivasaya, M[ontnahalli]

Insect transmission of spike disease of Sandal (*Santalum album* Linn.) Curr. Sci., 4(1): 17-19, 1935.

The results of studies with a large number of species of insects. Two species of Jassidae, three of Fulgoridae and three of Pentatomidae are suspected as being vectors.

-----, & Varadaraja Iyengar, A. V.

Experiments conducted by the Madras Forest Department in Collaboration with the Indian Institute of Science, II. Indian Inst. Sci. Bangalore. Invest. Spike disease of Sandal 7: 8-11, 1933.

A report on experiments for the killing of spike-diseased sandal trees.

Rao, M. G. Venkata, & Gopala, Iyengar

Studies in spike disease of sandal. Two types of spike diseases and the movement of the virus in sandal plants. Mysore Sandal Spike Invest. Comm. Bull. 4, 14 p., 1934.

Two strains of the disease are described. The active agent does not pass through the ringed stems but through parts of the phloem and cortical parenchyma.

Ravaz, L.

Le court-noue. (Short node of grapes). Prog. Agric. et Vitic. 81: 424-426, 447-452, 1924.

Believed to be due to soil conditions and to parasitism of smaller roots by a fungus.

Rawlins, T[homas] E[lsworth], & Tompkins, C[hristian] M[ilton]

Studies on the effect of carborundum as an abrasive in plants virus inoculation. Phytopathology 26(6): 578-587, 1936.

Finely powdered carborundum was found to be great aid in the inoculation of plants with viruses.

Reddick, D[onald]

Seed transmission of potato virus diseases. Amer. Potato Journ. 13(5): 118-124, 1936.

Reinmuth, E[rnest] F[riedrich]

Ein weiterer beitrage zur frage der eisenfleckigkeit der kartoffel. Zeitschr. Pflanzenk. 44: 117-119, 1934.

Remacle, G.

Maladie nouvelle de la pomme de terre. (New potato disease).
La Nature **63**(2): 29, 1935.

Reyneke, J. & Ekteen, L. L.

Bitter pit of apples. Farming in South Africa, 4 p., 1934.
Popular.

Rhode, G.

Kali im Stoffwechsel der Pflanzen unter besonder Berücksichtigung del Kalimangelerscheinungen au Kartoffeln. (Potash in plant metabolism with special reference to potash deficiency manifestations in Potatoes.) Ernähr. Pflanz. **31**(13-14): 237-243, 1935.

This is not a virus disease paper, but we decided to include it for the interesting notes that it contains on virus diseases. Here it is stated that potash deficiency is liable to promote infection by mosaic, and other diseases such as streak and leaf roll.

Rjachovsky, N.

Tomato leaf-roll in the Woronezh and Kursk provinces. Trans. Lenin Acad. Agric. Sciences. p. 79-81, 1936.

Paper read before the First Virological Conference, March 7-11, 1935. A description of the disease, discussion of yield and methods of control.

Riddle, Oscar

The confusion of tongues. Science **83**(2142): 41-45; (2143): 69-74, 1936.

This is not a paper on virus diseases but contains a brief discussion concerning the origin of life and viruses that is very interesting.

Rischkow, V[itilij] L.

(Mutations and diseases of the chloroplasts.) Ukrainian State Medical Publishing Board, p. 354, 1934.

Much of this paper is devoted to a discussion of virus disease.

-----, **Michailova, P. V., & Pivovarova, R.**

Virus diseases of Solanaceae in experiments of 1934. Trans. Lenin Acad. Agric. Sciences. p. 112-118, 1936.

Paper read before the First Virological Conference, March 7-11, 1935. Discussion of a disease caused by virus 1 of leaf-fern of tomato which corresponds to tobacco mosaic. Also of crinkle of tomato.

-----, **& Karatchevsky, I. K.**

(Experiments on the artificial transmission of virus diseases of the Tomato. Virus Diseases of plants in the Crimea and the Ukraine.) State Publ. Office of the Crimea Simperopol, p. 7-30, 1934.

A brief list of virus diseases of tomato and a description of the woody fruit or stolbur disease. May be carried by *Agallia sinuata*. The mosaic and fern leaf in Crimea are caused by the same virus (Johnson's tobacco virus No. 1.)

(Virus diseases of plants. General and specific virology.)
State Publ. Off. Lit. Collect. Co-op. Farming "Selkhozgiz"
Leningrad 247 p., 1935.

In this monograph the author reviews and discusses the progress attained in the study of virus diseases, the work done by other workers in different countries and the several theories advanced. The second part is a detailed account of the virus diseases known arranged by hosts. A 20 pages of bibliography is appended.

Filtrirbarer virus und formbildung (einfluss der filtrierbaren virus auf die formbildung, in bezug der frage nach dem wesen des ultravirus.) Int. Bot. Cong. Proc. 2: 195-197, 1935.

Virus diseases of plants and the nature of filterable virus: Trans. Linin Acad. Agric. Sciences. p. 11-12, 1936.

Paper read before the First Virological Conference, March 7-11, 1935. A brief review. The recent work indicates that the virus is dead substance of an enzymoidal character. The most interesting and encouraging phase of the subject is the field of physico-chemical investigations.

Rivera, V.

1 virus filterabili nella patologia vegetale. (The filterable virus in plant pathology.) V Cong. Naz. de Microb. Agrar. Perugia, Lab. Patol. Veg. Mem. 45: 47, 1934.

Experimental inoculation with sap from tobacco plants with streak. The virus has no effect on old organs but stimulates young ones. Also stimulates the neoplastic tissues in plants infected with *B. tumefaciens*. The sap from a diseased plant fermented less easily than that from a healthy plant. In some cases the virus caused fungi to grow slowly.

Roberts, R. H.

"Crinkle" on northwestern greening. Phytopathology 9: 261-263, 1919.

A description of this injury which has not been proved to be due to a virus.

Roland, G.

De vergelingsziekte en de mozaiekziekte van suiker-en voederbieten. II Onderzoek van de vergelingsziekte van de bit, met enkele opmerkingen over de mozaiekziekte. (Virus yellows and mosaic disease of sugar and fodder beet. II Investigation on Virus yellows and some remarks on mosaic.) Inst. Phytopath. Lab. Mycol en Aardappelonderzoek Wageningen, Holland. Meded 77: 54-70, 1936.

Reviews and compares the work of others giving results obtained.

(This paper is also included under Quanjer.)

Roshalin, L.

The nature of the concentric necrosis of the potato tuber. Trans. Lenin Acad. Agric. Sciences. p. 69-73, 1936.

Paper read before the First Virological Conference, March 7-11, 1935. (English summary.) This disease appears to be due to soil conditions.

Russell, T. A.

Report of the Plant Pathologist, 1934. Bermuda Bd. Agric. Rpt. 1934: 24-32, 1935.

In this report is included the description of a disease on lily known as "twist," characterized by excessive mottling and torsion of the leaves, tentatively is attributed to a virus.

Russo, G.

Il raggrinzimento o arricciamento del cotone nella Somalia Italiana. (Coiton leaf curl or crinkle in Italian Somaliland.) Agric. Colon 29(2): 78-95; (3): 133-143; (4): 188-199, 1935.

In this extensive report the author discusses the symptoms of the disease and gives experiments, based on them he concludes that the disease does not belong to the virus group of diseases.

Sadebeck, R.

Maniok oder Cassava, *Manihot utilisima* Pohl: p. 74-77.

Sakimura, I., & Carter, Walter

The artificial feeding of Thysanoptera. Annals Ent. Soc. Amer. 27(2): 341-342, 1934.

This paper is of interest because it is a study of *Thrips tabaci* which is a vector of virus diseases.

Salaman, Redcliff N[athan]

Research in relation to the production of "good" potato seed. Hort. Educ. Ass. Year-book Vol. II, 1933. (Agric. Progress, 11: 77-86, 1934.)

A part of this paper is devoted to the propagation of virus-free stocks. The Author describes the method.

Salmon, E[rnest] S[tandley], & Ware, W[illiam]

The chlorotic disease of the hop. IV. Transmission by seed. Ann. Appl. Biol. 22(4): 728-730, 1935.

28 to 228 seedlings grown from seed from a diseased plant showed symptoms of the disease.

Samuel, G[eoffrey], Best, R. J., & Bald, J[ames] G[rieve]

Further studies in quantitative methods with two plant viruses. Ann. Appl. Biol. 22(3): 508-524, 1935.

The authors give a tabulated account of the factors which influence the estimation by the primary lesion method of the concentration of the viruses of tobacco 1 and of spotted wilt of tomato.

Scarlett, Robert L.

Historical notes on the leaf-roll of potatoes. Scot. Journ. Agric. 16: 487-486, 1933.

Schander, Staar, et al.

Bericht über die Tätigkeit des Institutes für Pflanzenkrankheiten, 1933. Landw. Jahr. **79**: 14-22, 1934.

Schlumberger, Otto

Die Eisenfleckigkeit der kartoffel. (The Eisenfleckigkeit of potato.) Die Kartoffel **13**: 83-85, 1933.

Schmidt, E[rnst] W[illy]

Bericht über neue Arbeiten zur Biologie der Zuckerrübe (Report on recent investigations on the biology of the sugar beet.) Deutsch. Zuckerindustr. **60**(40): 864-866; (42): 901-902, 1935.

The author reports personal observations in connection with a review of recent work on leaf spot (*Cercospora beticola*), curly top and mosaic of beets. He states that in experiments at the Kleinwanzleben Research Institute in the transmission of beet mosaic by juice inoculations gave negative results and the suggestion is made that Verplancke's reputed success in this operation is based on an erroneous interpretation of his observations.

Das Vergilben der Zuckerrübenblätter. (The yellowing of sugar beet leaves.) Dutsch. Zuckerindust. **40**(1): 20, 1935.

Note giving the different yellowing of sugar beet leaves and its causes, includes the virus type of yellowing.

Zur Physiologie und Pathologie des Vergilbens der Zuckerrübenblätter. (On the physiology and pathology of the yellowing of sugar beet leaves.) Z. Wirtschaftsgr. Zuckerindustr. **85**(3): 200-214, 1935.

A continuation in Germany of the author's works reported above.

Zur pathologischen Physiologie albicater und mosaikkranker Zuckerrüben-Blätter. (On the pathological physiology of albicant and mosaic diseased sugar beet leaves.) Phytopath. Zeitschr. **8**(4): 363-368, 1935.

The author gives the results of his observations and experiments based on chemical analysis and microscopical examination.

Der stand der Forshung über Viruskrankheiten der Zuckerrübe. (The situation of the investigations on virus diseases of sugar beet.) Zuckerrübenbau **18**(1): 4-13, 1936.

Review of the work done on research of virus diseases of sugar beet during the past few years.

Schreven, D. A. van

Kalkgebrek als oorzaak van mergnecrose bij Aardappelknollen. (Lime deficiency as the cause of medullary necrosis of potato-tuber.) Tijdschr. over Plantenziekten **40**(11): 225-225, 1934.

This disease resembles a necrosis caused by a virus.

Virusziekten van de tomaat. (Virus diseases of the tomato.)
Tijdschr. over Plantenziekten 11(10): 261-300, 1935.

A summary of the subject. Only one virus disease of tomato (tobacco virus No. 1) known in Holland. The author describes a *Huisse* disease.

Serrano F[elicitissimo] B.

Pineapple yellow-spot in the Philippines. Philip. Journ. Sci. 58(4): 481-491, 1935.

General account of this disease first observed in Hawaii in 1928. Symptoms of the disease and transmission experiments are given.

Severin, H[enry] H[erman] P[aul], & Freitag, J[ulius] H.

California celery mosaic diseases. Phytopathology (Abstract) 25(9): 1935.

Shapovalov, Michael

Graft versus insect transmissions of curly top in tomatoes (tomato yellows) Phytopathology 25(9): 844-853, 1935.

This paper contains results which are very valuable. Insect transmission was more certain than graft transmission.

Effect of certain chemical on the "combination streak" virus of tomatoes. Phytopathology 25(9): 864-874, 1935.

This paper contains records of the effects of many chemicals on the two viruses causing tomato streak.

-----, & Dufrénoy J[ean]

Cytologische beobachtungen an einer viruskrankheit von Typhus "streak" oder "Strichel". Path. Zeitsch. 8(3): 297-231, 1935.

Work on virus diseases of plants in United States of America. Trans. Lenin Acad. Agric. Sciences. pp. 24-31, 1936.

Paper read before the First Virological Conference, March 7-11, 1935. A brief review. Refers to the wealth of plant material in the U.S.S.R. and the desirability of knowing more about the virus diseases.

Shepherd, E[dward] F[rederick] S[isnett]

A new disease of tobacco, possibly of the virus type. Mauritius Dept. Agric. Leaflet 40, 3 p., 1936.

The author gives the symptoms of the disease, compares it with other tobacco virus diseases, gives distribution and recommends roguing.

Simmonds, J[ohn] H[oward]

Diseases of the banana. Queensland Agric. Journ. 43(3): 254-267, 1935.

Popular notes on banana virus diseases are included.

Skuderna, A. W., Price, C., Gulbertson, J. O., & Cormany, C. E.
The curly-top resistant beet variety. *Facts About Sugar* **31**:
17, 1936.

Slagg, C. M.
New and unusual diseases and injuries of tobacco. *Sci. Agric.*
6(6): 193-198, 1928.

Smith, Kenneth M[anley]
Remarks on the size of plant-viruses. *Arch. Expt. Zellforsch.*
15: 1934.

Colour changes in wall-flowers and stocks. *Gar. Chron.* **93(2537)**:
112, 1935.

This is a brief discussion of color changes due to virus diseases
in wall flower and other plants.

New virus diseases of the tomato. *Journ. Hort. Soc.* **60(10)**:
448-451, 1935.

The author describes the symptoms of three virus diseases and
designates them by number.

A new virus disease of the tomato. *Ann. Appl. Biol.* **22(4)**:
731-740, 1935.

A description of a virus which attacks tobacco(*Nicotiana glutinosa*,
N. langsdorffii, *Datura stramonium*, potato, cowpea (*Vigna sinensis*),
Mimulus, *aster* & *Zinnia*.

A new virus diseases of tomatoes. *Nature* **135(3422)**: 908, 1935.

A description of a new virus disease attacking tomatoes and cow-
peas (*Vigna sinensis*).

Plant viruses. A book. Methuen (London) 107 p., 1935.

A general discussion of the subject.

-----, & Bald, J[ames] G[rieve]

A description of a necrotic virus disease affecting tobacco and
other plants. *Parasitology*, **27(2)**: 231-245, 1935.

This author describes this new disease and gives the symptoms on
several host. The method of transmission in nature is not known
but it can be transmitted to cowpeas by spraying with an atomizer.
The dilution end-points appears to be about 1: 10,000, the longevity
in sap about 20 days, the thermal death point about 72° C. and the
particle size 20-30 μ .

Two strains of streak: a virus affecting the tomato plant. *Para-
sitology*, **27(3)**: 450-460, 1935.

The author describes a green strain of tomato virus-I, on a variety
of Solanaceous plants and also yellow variant. They can be separated
by filtration. A complete cross-immunity exists between the two.

-----, & Doncaster, J. P.

The preparation of gradocol membranes and their application in the study of plant viruses. *Parasitology* 27(4): 523-542, 1935.

The authors give a detailed account of the technique established after three years study for the preparation of Elford's gradocol membranes and their application to the study of plant viruses.

The virus diseases of glass house and garden plants. *Sci. Hort.* 4: 126-140, 1936.

Popular descriptions of virus diseases of many plants.

The problem of a plant virus infection. *Nature* 136(3436): 395-396, 1935.

This is a continuation of the studies by the author and Bald on a necrotic virus disease of tobacco. *Parasitology* 27(2): 231-245, 1935.
The virus found in the roots of apparently healthy tobacco plants.

Some diseases of ornamental plants caused by the virus of tomato spotted wilt. *Journ. Roy. Hort. Soc.* 60(7): 304-310, 1935.

The author gives a preliminary discussion of the diseases, explains the method of spreading and discusses the relation of the disease on several hosts.

Recent work on the plant viruses. *Curr. Sci.* 4(8): 565-569, 1936.

An excellent review of the recent work on plant viruses, especially the insect vectors, the nature of the virus and the chemical and serological studies.

Some aspects of the plant virus problem. *Sci. Progress*, 30(119): 413-421, 1936. (*Rhodesia Agric. Journ.* 33: 134-142, 1936.)

An address before section K. of the British Association. The author gives a brief but excellent discussion of the subject.

Soltan, F.

Erfahrungen über die eisenfleckigkeit der Kartoffel. *Deut. Landw. Press* 61: 84, 1934.

Sornay, P. de

La cana á Sucre. Plantation par boutures de tetes it dégénérescence de la variété. (Sugar cane. Planting with terminal slips and varietal degeneration). *Bull. Ass. Chim. Sucr.* 42 (9-10): 638-642, 1935.

The author discusses the different methods of plantings. He disagrees with Martin's theory of sugar cane scab disease in regard to methods of planting. He discusses also scab disease.

Spegazzini, C[arlos]

Sobre una nueva enfermedad del tabaco (Regarding a new disease of tobacco.) Bol. Oficina Químico-Agrícola, Buenos Aires 4: 1928

Spencer, Ernest L.

Studies on frenching of tobacco. Phytopathology 25(12):1067-1084, 1935.

This paper is recorded because this disease has been confused with mosaic. The author summarizes his results in part as follows: "In the genus *Nicotiana* frenching developed severely in *N. alata*, *N. langsdorffii*, *N. longiflora*, *N. rustica*, *N. sanderae*, *N. sylvestris*, and in 16 varieties of *N. tabacum*, but not in 12 other species of *Nicotiana* grown under similar conditions. Of the other solanaceous and non-solanaceous species, only *Datura stramonium*, *Lycopersicon esculentum*, and *Petunia hybrida* showed chlorosis characteristic of frenching." "No association was found between frenching and any pathogenic organism." "Experiments on the deficiency of each of the elements essential to plant growth failed to produce symptoms that resembled those of frenching." "Frenching was produced in plants grown in sand by the addition at daily intervals of a water extract of field soil. It also was produced by adding as little as 1 part of field soil to 2,000 parts of sand. In young seedlings, in sand, it was produced by the addition of top water from a deep well, over a long period of time." "The experimental evidence indicates that frenching probably is not a mineral-deficiency disease, but a toxicity disease produced by some toxic principle that is present in certain soils and that exerts its toxic action only under definite environmental conditions.

Spierenburg, D.

Een virusziekte in lupinen. Donkers strepen en vlekken op de stengels; afsterven der toppen; gekroesd of violetbruin blad. Tijdschr. Plantenz. 42(3):71-76, 1936.

Spooner, E. T. C., & Bawden, F. C.

Experiments on the serological reactions of the potato virus "X". Brit. Journ. Expt. Biol. 16:218-230, 1935.

The authors report a common antigen in the sap of tobacco, *N. glutinosa*, *D. stramonium* and potato infected with potato virus "X". They describe the methods and give the reactions.

Sreenivasa Rao, Y. V.

Contributions to the study of the spike-disease of sandal (*Santalum album*. Linn.) XVIII. Investigation of the hexone bases. Journ. Indian Inst. Sci. 16A(8):91-93, 1933.

Contributions to the study of the spike-disease of sandal (*Santalum Linn.*) XIX. Study of mosaic associated with spiked areas. Journ. Indian Inst. Sci. 16A(8):94-95, 1933.

Srinivasan, M.

Experiments conducted by the Indian Institute of Science. Laboratory Experiments. Indian Inst. Sci. Bangalore, Invest. Spike-Diseases Sandal. 7: 12-13, 1933.

The diseased and healthy plants respond seasonal influences somewhat different.

-----, & **Srinivasaya, M[ontnahalli]**

Contributions to the study of spike-disease of Sandal (*Santalum album*, Linn.) Part XVII. Hydrogen-ion concentration and buffering capacity as factors of disease resistance. Journ. Indian Inst. Sci. 17A(14): 153-164, 1935.

Chemical and physiological studies.

-----, & **Rangaswami, S.**

A new device for the insect transmission of spike disease of sandal. Curr. Science. 4: 97-98, 1935.

Stanley, W. M.

Chemical studies on the virus of tobacco mosaic. IV. Some effects of different chemical agents on infectivity. Phytopathology 25(10): 899-921, 1935.

The results of testing the effect of 110 chemicals on the purified preparations of tobacco-mosaic virus. "The fact that tobacco mosaic virus was found to be unaffected over long periods of time by concentrations of mercuric chloride known to be germicidal is an indication that the virus is not a bacterial organism."

Chemical studies on the virus of tobacco mosaic. V-Determination of optimum hydrogen-ion concentrations for purification with lead acetate. Phytopathology 25(10): 922-930, 1935.

The author has determined the optimum hydrogen-ion concentrations for carrying out the three principal steps in the lead acetate process for the purification of tobacco-mosaic virus proposed by Vinson and Petri. The method and results are given.

Isolation of a crystalline protein possessing the properties of tobacco-mosaic virus. Science 81(2113): 644-645, 1935.

The author isolated a crystalline protein compound from mosaic tobacco which produced the typical disease when injected into Early Golden Cluster bean, *Nicotiana glutinosa* and *N. langsdorffii*. He describes the method and says that although the proof of the purity of the protein is not positive, there is no evidence of a mixture.

-----, & **Loring, H. S.**

The isolation of crystalline tobacco mosaic virus protein from diseased tomato plants, Science 83(2143): 83, 1936.

They say: "The isolation from a different host plant of a protein possessing the same physical, chemical and biological properties as

those previously found for the protein from mosaic-diseased tobacco plant offers additional evidence for the identity of the protein with the agent responsible for the tobacco-mosaic disease."

An improved method for the preparation of crystalline tobacco-mosaic virus protein. *Phytopathology* 26(2):108, 1936.

Abstract of paper read before 27th Annual meeting of the American Phytopathological Society, St. Louis, Mo., December, 1935. A description of a new method.

Chemical studies on the virus of tobacco mosaic. VI. The isolation from diseased turkish tobacco plants of a crystalline protein possessing the properties of tobacco mosaic virus. *Phytopathology* 26(4):305-320, 1936.

"A crystalline protein, which has the properties of tobacco-mosaic virus, has been isolated from an extract of Turkish tobacco plants infected with this virus. The extract was prepared by grinding frozen plants, adding disodium phosphate, and pressing out the liquid. The press cake was extracted a second time with dilute disodium phosphate and the two extracts were filtered through celite and combined. The virus protein was obtained from these extracts by precipitation with ammonium sulphate. The virus protein was reprecipitated with ammonium sulphate several times with loss of much color, and most of the remaining color was then removed with lead sub-acetate. The virus was adsorbed on, and removed from, celite several times and then crystallized in the form of small needles about 0.02 mm. long by the addition of a solution of 5 per cent glacial acetic acid in 0.15 saturated ammonium sulphate." "The crystalline material has the general properties of a protein and its ineffectivity, chemical composition, and optical rotation were unchanged after 10 crystallizations. The material is between 100 and 1,000 times more active than ordinary infectious juice preparations, one cubic centimeter of a solution containing 10⁹ gm. per cc. of the protein usually proving infectious. The crystalline material reacts with sera of animals injected with a solution of the crystals or with infectious juice, and fails to react with the sera of animals injected with juice from normal plants. All of the evidence obtained up to the present time indicates that the crystalline protein is pure or possibly a solid solution of proteins, and hence, that tobacco-mosaic virus is a protein."

Stevens, Neil E[verett]

An attempted analysis of the economic effects of cranberry diseases. *U.S.D.A. Plant Disease Reporter* 19(8):112-128, 1935.

Extensive account of losses due to false blossom of cranberry.

Stevenson, F. J.

What's inside the potato. *Amer. Potato Journ.* 11:229-234, 1934.

Stewart, Fred C[arlton]

A potato seed plant roguing experiment. New York State Agric. Expt. Station (Geneva) Bull, **655**, 10 p., 1935.

The results of nine years experiments for the control of virus diseases.

Steyaert, R. L.

Étude du shedding en rapport avec la frisolée du cotonnier. (A study of shedding in relation to frisolée of cotton.) Bull. Agric. Congo Belge **26**(1): 3-45, 1935.

Similar to tomosis. Not proved to be a virus.

Storey, H[arold] H[aydon]

Virus diseases of East African plants. I, II, & III. East African Agric. Journ. **1**(1): 63-68; (2): 148-153; (3): 206-211, 1935.

Popular.

Report of the Plant Pathologist. East African Agric. Res. Stat. Rpt. **1934-35**: 12-16, 1935.

This report treats wholly on corn and cassava virus diseases.

On the future of research on the virus diseases of plants. Proc. Fifth Congress Int. Soc. Sugar Cane Tech. Brisbane, Australia p. 108-116, 1936.

The author predicts that the future studies of these diseases must center around species or strains of viruses and the vectors.

Strong, L. A.

Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1935, 96 p., 1935.

This report includes the work done to control phony disease of peaches.

Summers, Eaton M.

Strains of the sugar cane mosaic virus in Louisiana. Proc. Fifth Cong. Int. Soc. Sugar Cane Tech., Brisbane, Australia, 723-729, 1935.

A very thorough discussion of this subject to date.

Sundararaman, S.

Mosaic disease of sugar cane in South India. Madras Agric. Dept. Bull. **32**. 1929.

The results of a survey for 1925-28, with a discussion of symptoms and effects, methods of infection and spread, and varietal resistance.

The diseases of sugar cane. A paper read at the M.A.S.U. Conference, July, 1930 and published in the Madras Agric. Journ. of August, 1930.

This paper contains brief discussions of mosaic and streak.

The mosaic disease of sugar cane. Leaflet 31, 2 p., 1931.

A popular discussion.

Tasugi, H., & Ikeno, S.

(On the intracellular bodies associated with the mosaic disease of the lily (Preliminary report). Ann. Phytopath. Soc. Japan, 5(1): 30-43, 1935.

A mosaic disease of *Lilium speciosum* L. *rubrum*. A study of the intracellular bodies.

Tate, H. D.

Intracellular abnormalities associated with yellow dwarf of onions. Iowa State College Journ. Sci. 9(4): 677-683, 1935.

A very few irregularly distributed bodies.

Thilliard, R.

La culture du tabac de Sumatra au Cameroun. (The culture of Sumatra tobacco in Cameroon.) L'Agron. Col. 6: 185-194, 1921.

Bestrijding der krul-en kroepoek-ziekte van tabak. (Control of the curl and crinkle disease of tobacco). Meded. Proefstat. Vorstenl. and. Tabak (Java) 78: 18, 1934.

Thornberry, H. H.

Quantitative studies on the filtration of tobacco-mosaic virus. Phytopathology 25(6): 601-617, 1935.

The author gives the results of extensive studies and finds that (1) when dilutions of virus are passed through Berkefeld "W" filters the filtrates are as infective as nonfiltered, (2) at pH 8.5 the virus is completely filterable and at 1.5 nonfilterable, (3) virus suspended in an acid medium is adsorbed to the Berkefeld filter at the beginning of filtration. After the filter surface is saturated with adsorbed materials at pH 5.6, the filtrate is about as infectious as the non-filtered sample until the clogged pores retain most of the virus, (4) virus adsorbed to the filters from an acid suspension is readily eluted in phosphate buffer at pH 8.5, about 80 per cent of the virus is released in 10cc. of the buffer, (5) filtration of virus at pH 8.5 through Berkefeld "W" candles increased its infectivity 66 per cent, (6) the diameter of the virus particles is estimated to be 18-38 μ .

Effect of phosphate buffers on infectivity of tobacco-mosaic virus. Phytopathology 25(6): 618-627, 1935.

These studies are summarized as follows: (1) Valency of the anion or cation of the salts tested had no measurable effect upon infectivity of tobacco-mosaic virus, (2) dibasic phosphate salts at 0.1 molar concentration greatly enhanced virus infectivity, (3) optimum reaction for infection is from pH 7.0 to 8.5, (4) virus was inactivated in 1 hour between pH 1.5 and 9.0. At pH 10.6 complete inactivation

resulted in 4 hours, and at pH 11.2 in 5 minutes and in 0.5 molar H Cl. inactivation was complete in 1 hour, (5) the presence of aluminum sulphate greatly reduced infection but when the reaction was adjusted to pH 8.5 the original virus activity was restored.

Effect of tannic acid on the infectivity of tobacco-mosaic virus.
Phytopathology 25(10): 931-937, 1935.

The inhibition of the virus when treated with tannic acid depends on the concentration of the acid and time of action. The activity of the virus is restored by removal of the tannic acid from the suspension. The inhibition of the virus when the plants were treated with tannic acid before inoculation depended on the concentration of the acid. Tannic acid in concentrations as high as 10 per cent had slight effect when applied after inoculation with the virus.

Particle diameter of certain plant viruses and *Phytomonas pruni* bacteriophage. Phytopathology 25(10): 938-946, 1935.

Thirteen plant viruses were used and the diameters determined at about 15 μ . In one tobacco virus the particles were found to have a diameter of 11 μ which was the same as that of the particles of *Phytomonas pruni* bacteriophage.

Thornton, J. K.

Blackberries: Possible source of streak infection in black raspberries. Phytopathology 25(10): 959-961, 1935.

The author reports a streak disease of Blackberries which is the same as that reported by Zundel in 1934 and gives evidence that it is the same as the streak of black raspberries.

Thung, T. H.

Infective principle and plant cell in some virus diseases of the tobacco plant II. Handelingen v/h. 7 de Ned-Ind. Natuurwetenschappelijk Congress. 1935: 496-507, 1935.

This is a continuation of the first paper (in Dutch) published under this same title in 1931. It is primarily a study of immunity.

Phytopathologische waarnemings (Phytopathological observations.) Meded. Proefst Vorstenl Tab. 81: 25-37, 1935.

Notes on "Kroepoek" disease and "pox" a new virus disease are included in this report. The last disease is transmitted by *Myrus persicae*.

Tireman, H.

Proc. Spike Conference, Bangalore, 1917.

Trotter, A[lesandro]

Le virosi del *Cestrum parqui* L' Hér. (Virus diseases of *Cestrum parqui* L' Herit) Ric. Ossuz. Divulg. Fitopat. Campania ed Mezzogiorno (Portici), 4: 18-24, 1935.

A description of the disease.

Troy, Zeliaette,

Aster yellows and its control. Flor. Exch. **85**(16): 13, 1935.

A review of Kunkel's work.

Tschernyschova, O. P.

Schädlichkeit von Viruskrankheiten der Kartoffel. (Damage from potato virus diseases.) Arb. Forsch. Inst. Kartoff., **1935**: 59-84, 1935. (Bot. Zbl. (Abstract) **27**(5-6): 170-171, 1935.)

Data on production on potato affected by virus diseases in U.S.S.R.

Contribution to the diagnostics of potato virus diseases. Trans. Lenin Acad. Agric. Sciences, p. 42-50, 1936.

Paper read before the First Virological Conference, March 7-11, 1935. The author divides these diseases into four groups: (1) mosaics, including mild mosaic, rugose mosaic and streak, (2) leaf roll, (3) witches' broom, and (4) aucuba. Uses the Bechhold and Erbe method of testing the coloring of the flesh.

Twort, F. W.

The transmissible bacterial lysin and its action on dead bacteria. The Lancet **209**(5326): 642-644, 1925.

This transmissible lysin has some of the characters of a virus.

Valleau, William D[orney]

A method for describing strains of tobacco mosaic virus. Phytopathology **26**(2): 111-112, 1936.

Abstract of a paper read before the 27th annual meeting of the American Phytopathological Society, St. Louis, Mo., Dec. 1935. The author described methods for the determination of 18 viruses.

Do necrotic lesions result in localization of tobacco-mosaic virus in *Nicotiana*? Phytopathology **25**(10): 968, 1935.

The author gives the results of studies which show that necrotic lesions do not always result in a localization of the virus.

-----, & Johnson, E. W.

Only certain strains of tobacco mosaic cause mosaic burn. Phytopathology (Abstract) **25**: 967, 1935.

Varadaraja Iyengar, A. V.

Experiments conducted by the Indian Inst. of Sci. II. Indian Inst. Sci., Bangalore Invest. Spike-Disease Sandal **7**: 14-15, 1933.

Methods for destroying diseased trees.

Biochemistry of the spike disease of *Vinca rosea* Linn. Journ. Indian Inst. Sci. **18A**(9): 61-67, 1935.

The author compares the results with those of spike on other hosts.

Deamination in virus-infected plants. *Nature* (London) **135** (3409): 345, 1935.

A chemical study of spike of Sandal.

The problem of *Lantana*. *Curr. Sci.* p. 1, 1935.

-----, & Rangaswami, G.

Studies in the control of the spike disease of sandal. Part I. The role of infection centre and *Lantana* in the spread of disease. *Indian Forester* **61**(1): 25-34, 1935.

The rate of spread of the disease is independent of the size and age of the sandal plant. *Lantana* increases the incidence of the disease. The disease can be controlled by removal and burning.

-----, & -----

Studies in the control of spike disease in Sandal. Part II. Use of plant poison in controlling the spread of infection. *Indian Forester*. **1935**: 103-111, 1935.

Arsenicals were the most successful chemicals. Girdling and smearing with the poison was most useful.

Verderevsky, D.

A new cotton disease in the Azerbaijan. *Trans. Lenin Acad. Agric. Sciences* **1936**: 74-78, 1936.

Paper read before the First Virological Conference, March 7-11, 1935, (English summary). A description of this disease which is transmitted by *Bemisia gossypiperda*.

Verplancke, G[ermain]

Étude des propriétés des virus causant les maladies de dégénérescence de la betterave. (Study of the properties of viruses causing degeneration diseases of the beet.) *Sucrerie Belge*. **54**(7): 118-127; (8): 142-151; (9): 162-168, 1935.

The results of experimental studies on yellows and mosaic. The author gives four types or symptoms of the mosaic,—sprenkel, nerven, marmor and porchen.

Étude d' une forme nouvelle de la "bigarrure" de la pomme de terre. *Bull. Soc. Roy. Bot. Belgique* **67**(2): 105-116.

This appears to be a new disease. The authors give a description, a list of hosts and the results of experimental studies.

Vincent, C[hester] L[eon], & Jones, L[eon] K[ilby]

Resistance of potato varieties to infection by veinbanding virus. *Phytopathology* **26**(2): 112, 1936.

Abstract of paper read before the 27th annual meeting of the American Phytopathological Society. St. Louis, Mo., Dec. 1935. A brief resumé of 12 years study on 1,055 strains of potato seedlings with reference to the veinbanding virus.

Vinson, C. G.

Virus diseases of plants. Purification of the virus of mosaic diseases of tobacco. Missouri Agric. Expt. Sta. Res. Bull. 237, 16 p., 1936.

Wakeland, Claude, & Hungerford, C[harle] W[illiam]

Idaho recommendations for insect and plant disease control. Idaho Agric. Expt. Sta. Bull. 159: 62-63, 1934.

Wartenberg, H., Linkowski, M., & Hey, A.

Der Tagesparzellenversuch. Beiträge zur methodik der Kartoffel abbauforschung. (The day plot experiment. Contributions to the technique of potato degeneration research.) Angew. Bot. 17(1): 74-94, 1935.

The authors give an explanatory account of the "day plot experiment". Here is stated that basal roll, leaf roll and crinckle coincided with the variations in the absolute atmospheric humidity prevailing during the planting times in the previous years. Potato degeneration is a metabolic anomaly induced by environmental conditions. Due to weakening of the plant by primary physiological disease are predisposed to attacks of virus diseases. Conclude stating that potato degeneration may thus eventually result from a leaf roll arising from ecological conditions and a virus component.

-----, **Hey, A., & Urhan, O.**

Die elektrometrische Pflanzgutwertbestimmung der Kartoffelknolle. I Mitteilung (The electrometric determination of the seed value of the potato tuber. Note I.) Arb. Biol. Reichsanst. Land-u. Forstw. 21(3): 331-362, 1935.

This is a highly technical discussion on the foundations of the electrometric method of determining the value of potato tubers for seed, with a view to the elimination by this means of individuals suffering from *degeneration*.

Webber, Irma E., & Fawcett, H[oward] S[amuel]

Comparative histology of healthy and psorosis affected tissues of *Citrus sinensis*. Hilgardia 9(2): 71-93. 1935.

A very thorough and complete study of the histology of the diseased trees. These studies suggest that the cause is a virus.

Weij, H. G. van der

Ziekten der Tabak. (Tobacco diseases) Meded. Deli-Proefst. ser. II. 91: 4-11, 1935.

This report includes discussions on the virus diseases mosaic ("peh aim"), Rotterdam B disease, "gilah", "korab" and "daon lidah".

Winter, H. C., & Young, H. C.

Raspberry virus disease control. Ohio Agric. Expt. Sta. Bimonth-Bull. 21(179): 54-58, 1936.

Popular.

Wolcott, George] N[orton]

The first records of the mosaic disease of sugar-cane in Puerto Rico. *Journ. Agric. Univ. Puerto Rico*, 19(2): 117-120, 1935.

A statement of early observations in Puerto Rico, which have not been published previously.

Wolf, Frederick, A.

Diseases of tobacco caused by viruses. Chapter VI treats of Tobacco Diseases and Decays. p. 110-197. Duke University Press, 1935.

The author gives a general discussion of virus diseases and descriptions of many of the recognized diseases.

Youden, W. J.

Statistical aspect of the production of primary lesions of plant viruses. *Nature*, 135(3426): 1075, 1935.

A discussion of the failure of Samuel and Bald to reconcile their work with that of the author.

Zacharewicz, E.

L' enroulement des feuilles de la vigne. *Prog. Agric. Vitic.* 104: 280-282. 1935.

After 20 years experiments, author finds that the disease is infectious, probably a virus disease, calls it an incurable disease of the sap." (*Plant Science Literature*, 2(15): 14, Oct. 7-12, 1935.

Zaumeyer, William] J., & Wade, B. L.

The relationship of certain legume mosaic to bean. *Journ. Agric. Res.* 51: 715-749, 1936.

The bean is susceptible to the mosaic viruses of pea, white clover, alsike clover, white sweet clover, alfalfa, and sweet pea. The mosaic virus of red clover is not transmissible to the bean.

-----, & -----

A pea streak caused by alfalfa mosaic. *Phytopathology* 26(2): 114, 1936.

Abstract of papers read before the 27th annual meeting of the American Phytopathological Society. St. Louis, Mo., Dec., 1935. This appears to be a new disease, different from the streak of Hawaii.

-----, & -----

Pea mosaic and its relationship to other legume viruses. *Phytopathology* 26(2): 114, 1936.

Abstract of paper read before the 27th annual meeting of the American Phytopathological Society. St. Louis, Mo., Dec., 1935. The paper gives the results of a yield survey of hosts. Only 11 out of 3,057 seedlings grown from mosaic plants showed symptoms of disease.

-----, & Kearns, C. W.

The relation of aphids to the transmission of bean mosaic. *Phytopathology* 26(7): 614-629, 1936.

Aphids are not found in large numbers in the bean fields but the spread of the disease is dependent on the abundance of these insects. Eleven species from 17 different hosts proved to be vectors.

Zeller, S[anford] M[yron]

Cherry mottle leaf. Ann. Rpt. Oregon State Hort. Soc. **26**: 92-95, 1934. (1935)

A brief description of a virus-like disease on Napoleon cherry.

Simultaneous infections of strawberries with crinkle and yellows (Xanthosis). Plant Disease Reporter. **22**(13):208-209, 1936.

These two diseases are distinct. The virus of yellows appears to mask the crinkle. The vector for both diseases is *Capitophorus fragaeifolii*.



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Page 139 citation 7, Doli should read Deli.

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Page 156 citation 7, Omit annotation.

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THE ANTS OF PUERTO RICO

By M. R. SMITH,

Bureau of Entomology and Plant Quarantine, United States Department of Agriculture.

For approximately one year, from July 1935 to early June 1936, the writer was stationed in Puerto Rico in connection with investigations of insect pests of Puerto Rico conducted with special funds available to the Bureau of Entomology and Plant Quarantine. His particular assignment was to investigate insects attacking coffee, especially with reference to the relationship between ants and certain mealybugs and scale insects attacking coffee. In connection with the ant phase of the coffee insect problem in Puerto Rico, opportunity was given for travel over the island and, incidental to these investigations relating to coffee insects, the writer made a rather extensive collection of the ants that are found in Puerto Rico and observations concerning their occurrence. The first series of specimens of each species is deposited in the collection of the U. S. National Museum, and duplicates will be deposited in other collections.

Very little was known about the ant fauna of Puerto Rico until March 1908. During that month, Dr. W. M. Wheeler of Harvard University visited the island and made a collection and study of the ants. Although collections were made on the main island and several of the smaller, adjacent islands, no visits were made to Vieques or to the rich tropical forest of the highest mountain on the island, El Yunque. The thoroughness of Wheeler's work and the accuracy of his observations are more apparent perhaps to one like myself who has attempted to study the ants in the same localities studied by Wheeler 28 years ago. My collections and studies for the most part have been made on the western end of the island, principally in the región centering around Mayagüez where the rainfall is ap-

proximately 80 to 100 inches each year and altitudes range from sea level to about 3,000 feet (one of the peaks in the Maricao Insular Forest). I did not visit any of the smaller islands nor have I collected on El Yunque. At first thought it might appear foolish for one to collect and study ants in a region that has already been rather adequately covered. However, I spent one year on the island, whereas Wheeler had only a few weeks in which to make his observations. As a result of my longer stay on the island I was able to collect more information on the distribution, biology, and economic importance of the ants than was permitted Wheeler.

As Wheeler has previously and aptly stated, one would not expect to find as many ants on an island as on a continental area of similar size; furthermore, with an island so densely populated as Puerto Rico (465 inhabitants to the square mile) and practically all of the land in cultivation, few areas of virgin forest are left and these only on the highest mountains. My collecting in the Maricao Insular Forest, however, around altitudes of 3,000 feet has been rather disappointing. Here I found only about ten species and these included only one new form although I have searched this area for ants at least a half dozen times.

The ants that are most apt to attract the casual observer's attention in Puerto Rico are such species as the "hormiga brava", *Solenopsis geminata* Fabr.; the "hormiga loca", *Prenolepis longicornis* Latr.; the "albaricoque", *Tapinoma melanocephalum* Fabr.; and *Pheidole fallax jelskii* var. *antillensis* Forel. The habits of these ants are discussed rather fully elsewhere in this article, so the species need not be considered further here.

In 1908 Wheeler listed 51 species of ants for the island, if we omit *Neoponera villosa* Fabr., which I feel quite positive does not occur in Puerto Rico. Wolcott, in listing the ants of the Island in his *Insectae Portoricensis* (1923), records 55 species. I have failed, however, to include in this article 3 of the species mentioned by Wolcott, namely, *Pseudomyrma flavidula* var. *delicatula* Forel, *Monomorium minutum* Mayr, and *Camponotus cuneiscapus* Emery, there being some doubt in my mind that two of these species, at least, occur in Puerto Rico. Even with these exceptions the article includes 66 species. Of

this number 20 species (or 30.3 percent) have been described from Puerto Rico. The species referred to are as follows:

1. *Cerapachys* (S.) *seini* Mann
2. *Odontomachus* *haematoda* var. *notata* Mann
3. *Cardiocondyla* *venustula* Whlr.
4. *Solenopsis* *globularia* var. *borinquenensis* Whlr.
5. *Solenopsis* *globularia* var. *desecheoensis* Mann
6. *Solenopsis* *azteca* var. *pallida* Whlr.
7. *Pheidole* *subarmata* var. *borinquenensis* Whlr.
8. *Pheidole* *moerens* Whlr.
9. *Macromischa* *isabellae* Whlr.
10. *Macromischa* *isabellae* *mutica* subsp. nov.
11. *Macromischa* *albispina* Whlr.
12. *Macromischa* *albispina* subsp. *pallipes* Mann
13. *Strumigenys* *louisianae* var. *obscuriventris* Whlr.
14. *Myrmicocrypta* *brittoni* Whlr.
15. *Mycocepurus* *smithi* var. *borinquenensis* Whlr.
16. *Iridomyrmex* *melleus* Whlr.
17. *Iridomyrmex* *melleus* var. *fuscescens* Whlr.
19. *Myrmelachista* *ramulorum* Whlr.
19. *Myrmelachista* *ramulorum* subsp. *fortior* Whlr.
20. *Prenolepis* (Nylanderia) *microps* sp. nov.

Eight species (or 12.1 percent) are introduced forms. These are:

1. *Monomorium* *pharaonis* Linn. "Pharaoh's ant"
2. *Monomorium* *destructor* Jerdon
3. *Monomorium* *floricola* Jerdon
4. *Pheidole* *megacephala* Fabr.
5. *Tetramorium* *guineense* Fabr.
6. *Tetramorium* *simillimum* Nyl.
7. *Prenolepis* (Nylanderia) *longicornis* Latr., "crazy ant"
8. *Tapinoma* *melanocephalum* Fabr., "albaricoque"

The rarest ant that has been found on the Island is *Cerapachys seini*, a species representing one of the most primitive of the subfamilies of ants and not known from any other island of the West Indies than Puerto Rico. The absence of any of the

species of the subfamily *Dorylinae* is also worth remarking about. These ants are apparently very rare in the West Indies, having been collected to date only from the Islands nearest South America, namely, St. Vincent, Grenada, and Trinidad. A number of genera in Puerto Rico have only one or so species in them, such genera being *Crematogaster*, *Pseudomyrma*, *Camponotus*, *Tapinoma*, *Iridomyrmex*, etc. Some of the tropical genera like *Cryptocerus*, *Dolichoderus*, *Azteca*, and *Eciton* are devoid of any representatives at all.

In preparing this article I have drawn freely on Wheeler's bulletin, "The Ants of Puerto Rico and the Virgin Islands", and the list of ants in Wolcott's "Insectae Portoricensis". In addition to this, various colleagues have very kindly turned over to me their records which pertain to the distribution or habits of the ants as well as their associations with other economic insects. To conserve space in the following article the names of these are given by initials. The men referred to are as follows: George N. Wolcott, Francisco Sein, Jr., W. M. Wheeler, W. M. Mann, F. E. Lutz, D. L. Van Dine, H. L. Dozier, A. H. Madden, J. W. Balock, T. H. Jones, F. M. Wadley, L. C. Fife, J. D. Moore, R. H. Van Zwaluwenberg, H. K. Plank, José Sepulveda, and the writer.

KEY TO THE SUBFAMILIES

(for the identification of workers)

1. Cloacal orifice round, terminal, surrounded by a fringe of hairs ----- *Formicinae* 2
 Cloacal orifice ventral, slit-shaped -----
2. Petiole 1 - segmented ----- 3
 Petiole 2-segmented ----- 4
3. No definite constriction between the first and second gastric segments; body soft and flexible; anal glands present which often produce a very characteristic odor ----- *Dolichoderinae*
 A definite constriction between the first and second gastric segments; body wall firm ----- *Ponerinae* and *Cerapachyinae*
4. Clypeus not prolonged back between the frontal carinae; median spurs of middle and hind legs pectinate; eyes excessively large; elongate, rather slender ants ----- *Pseudomyrminae*
 Clypeus almost always prolonged back between the frontal carinae, if not, then the spurs of the middle and hind tibiae are simple or absent. . . *Myrmicinae*

SUBFAMILY CERAPACHYINAE

1. *Cerapachys* (S) *seini* Mann

Jour. Wash. Acad. Sci., Vol. 21, pp. 440-441, 1931. *Worker*
 Río Piedras (F. S.)

This rare ant was found by Francisco Sein in a sugar cane field at Río Piedras, where Mr. Sein observed the larvae of the ant feeding on the larva of the sugar cane root caterpillar, *Perforadix sacchari* Sein. No other species of this rare genus has been found in any of the West Indian Islands, which thus makes the record a very unique one. It is presumed that this ant may have been imported into Puerto Rico through sugar cane introductions.

The worker of this species can be partly distinguished by its 9-segmented antenna and the lateral carina on each side which separates it from the cheek. The antennal insertions are exposed, and the frontal carine are distinct from each other.

KEY TO THE SPECIES OF THE SUBFAMILY PONERINAE

(for the identification of workers)

1. Mandibles linear, inserted close together at the middle of the oral border; petiole terminating in a spine or point above ----- 2
 Mandibles inserted at the corners of the head; petiole rounded or flattened above ----- 6
2. No oblique swellings starting from the eyes to border the antennal fossae; the latter not confluent---- 3
 On each side of the face an oblique swelling extending out from the eye and bordering the antennal fossae ----- 4
3. Mandibles short, broadened in their distal part and narrowed just before the preapical tooth-----
 Anochetus (A.) *mayri* Emery
 Mandibles long, not broadened in their distal part, denticulate along the entire inner margin-----
 Anochetus (S.) *emarginatus* subsp. *testaceus* Forel
4. Body deep black throughout; large and robust ants--
 Odontomachus haematoda Linn.
 Body of variable color ----- 5
5. Dorsal surface of the epinotum, the petiole, and the femora brownish-red; large and robust ants-----
 Odontomachus haematoda var. *notata* Mann
 Head paler; petiole with a shorter and less acuminate spine; size smaller --- *Odontomachus haematoda* var. *ruginodis* Whlr.

6. Insertions of the antennae remote; clypeus flat; claws pectinate ----- *Platythyrea punctata* F. Smith
Insertions of the antennae approximated; claws simple 7
7. Middle and hind tibiae with two spurs each-----
Euponera (T.) *stigma* Fabr.
Middle and hind tibiae with a single spur each----- 8
8. Body very glabrous ----- *Ponera ergatandria* Forel
Body opaque or subopaque ----- 9
9. Head with numerous punctures which give the general surface a subopaque effect ----- 10
Head with fewer punctures which give the general surface a more glabrous appearance--*Ponera trigona*
var. *opacior* Forel
10. Petiole viewed from the side distinctly rectangular shaped, almost as wide dorsally as ventrally-----
Ponera opaciceps Mayr
Petiole viewed from the side very distinctly narrower dorsally than ventrally ----- *Ponera opaciceps*
var. *jamaicensis* Aguayo

SUBFAMILY PONERINAE

2. *Platythyrea punctata* F. Smith.

Cat. Hymen. Brit. Mus., Vol. 6, p. 108, 1858. *Worker, Male*
Between Arecibo and Utuado (W. M. W.); Mayagüez (M. R. S.)

This ant, which is common throughout the West Indies, seems to prefer to nest in well-shaded locations. I have found it nesting in stumps and logs in colonies of only a hundred or two hundred individuals. The highly predacious workers forage singly on the ground or even up the trunks of trees. When alarmed they run with considerable speed.

The worker, although black, has such a dense coat of pubescence on its body that the latter imparts a pruinose or metallic effect. As the name indicates, the body is covered with numerous and conspicuous punctures.

3. *Euponera* (T.) *stigma* Fabr.

Syst. Piez., p. 400, 1804. *Queen*

Culebra (W. M. W.); Utuado (W. M. W.); Mayagüez, Maricao Insular Forest (M. R. S.)

This species nests by preference in well-rotted stumps and logs, or in the soil beneath stones in shaded areas. These ants

seem to like abundant moisture and are most often found near the bases of stumps. The colonies comprise only a few hundred individuals. Cocoons are light yellowish or sulphur colored. Specimens have been taken at altitudes as high as 3,500 feet. Workers, although predacious, are not commonly seen foraging openly in the woods like some of the *Odontomachus* and other ants. The workers are also slower of movement than some of the other Ponerine ants. On October 1 and November 20 both winged males and winged females were noted in a nest. The former are exceedingly active.

The worker is very deep brown or blackish with lighter appendages. The meso- and metapleuræ are longitudinally straited, and the epinotum is laterally compressed.

4. *Ponera ergatandria* Forel.

Trans. Ent. Soc. London, p. 365, 1893. *All castes.*

Utuaado (W. M. W.); Guayama, Sabana Grande, Lajas (H. L. D.); Ensenada, Mayagüez (M. R. S.)

This species appears capable of living in both very arid and moist habitats. I have found colonies nesting in the soil and in decaying logs and stumps, and Dozier has collected workers from cow dung on numerous occasions. Like the Ponerine ants previously mentioned, the workers are predacious and the colonies small. As the specific name indicates, this species has males in which both worker and male characters occur in the same individual.

P. ergatandria seems to be a common species in the islands of the West Indies.

The worker is characterized by its very short antennal scapes, which lack considerably of reaching the posterior border of the head, its small size (2.5-2.7 mm.), its glabrous appearance, and peculiarly shaped petiole.

5. *Ponera opaciceps* Mayr.

Verh. Zool. Bot. Ges. Wien., Vol. 7, p. 536, 1887. *Worker, Male.*

Culebra (W. M. W.); Utuaado, Monte Morales, Monte Man-

dios, and Coamo Springs (W. M. W.); Sabana Grande, Lajas (H. L. D.); Mayagüez, Ensenada (M. R. S.)

This is probably the commonest species of *Ponera* in Puerto Rico. Its habits are similar to those of the preceding species. Specimens have also been collected from beneath cow dung at frequent intervals.

The worker, which is from 3 to 3.2 mm. in length, is black with light brown appendages; its head is opaque, and the petiole when viewed from the side is rectangular shaped, that is, not shorter dorsally than ventrally.

6. *Ponera opaciceps* var. *jamaicensis* Aguayo.

Bull. Bklyn. Ent. Soc., Vol. 27, pp. 216-217, 1932. *Worker* Ensenada (H. L. D.); 18 kilometers north of Yauco (M. R. S.)

I have referred to this variety a number of specimens collected in the above-mentioned localities. These differ from typical specimens of *opaciceps* in the following characters: (1) shorter antennal scape, (2) narrower petiolar border, (3) more glabrous body surface, etc. Workers have been collected from the same type of habitats and under the same conditions as those of the species.

7. *Ponera trigona* var. *opacior* Forel

Trans. Ent. Soc. Lond., Pt. A, pp. 363-364, 1893. *Worker, Queen.*

14 kilometers east of Mayagüez (M. R. S.)

This species has habits similar to those of *opaciceps* and *ergatandria*. The ants are recorded from Cuba, Jamaica, and the Dominican Republic in the West Indies.

The worker of *opacior* can be distinguished from the worker of *opaciceps* by the shape of its petiole and the sculpturing of the head, and from the worker of *ergatandria* it is distinguished by its longer antennal scapes, less glabrous body, and rounder epinotal declivity.

8. *Anochetus mayri* Emery

Ann. Mus. Civ. Genova, Vol. 21, p. 378, 1884. *Worker*

Utuaado, Vega Baja, Monte Morales, Monte Mandios, Coamo Springs, San Juan, Adjuntas, Arecibo (W. M. W.); Mayagüez, Maricao, Arecibo, Maricao Insular Forest (M. R. S.)

This ant seems to be the most common species of the genus in the West Indies. Colonies are exceedingly small, comprising only a few individuals. Although the ants seems to nest by preference in shaded areas, I have also found them colonized in the open. Their colonies may be found either in the soil or in the decaying wood of stumps and logs. The workers, which are slow of movement, forage singly. Cocoons are light yellowish, with a black spot at one end. Several winged queens were noted in a nest on August 10.

The characters given in the key to the species clearly distinguish this species from the following one.

9. *Anochetus emarginatus* subsp. *testaceus* Forel.

Trans. Ent. Soc. Lond., p. 356, 1893. *Worker, Male*
Culebra (W. M. W.)

I have not encountered this ant on the western end of the Island of Puerto Rico where I have done most of my collecting. This species may occur, however, on the eastern end of the Island.

Wheeler states that he found "several colonies nesting under stones in the shade of trees along the dry arroyos on the higher part of the Island of Culebra." He also states that the colonies are small, numbering only from about thirty to a hundred individuals.

10. *Odontomachus haematoda* Linn.

Syst. Natur., Ed. Vol. 10, p. 582, 1758 *Worker*

Arecibo, Utuaado, Monte Morales, Monte Mandios, Adjuntas, Vega Baja, Aibonito, Coamo Springs (W. M. W.); San Germán, Mayagüez, 10 kilometers northwest of Ponce, 18 kilometers north of Yauco (M. R. S.)

This species nests by preference in shaded areas. It is very common in the coffee groves of the hills and mountains. Colonies may be found in the soil or in the well-rotted wood of

logs and stumps. Most of the nests appear to contain several hundred individuals. The workers have foraging habits similar to the species mentioned above. A large number of winged queens were found in a nest on March 20 and males on April 5. The workers can leap several inches by closing their widely opened mandibles suddenly, thus making a clicking sound in doing so. Their sting, although slightly painful, does not last long.

The typical worker of this species is large and robust, and of a deep blackish color, with slightly lighter appendages.

11. *Odontomachus haematoda* var. *notata* Mann.

Bull. Amer. Mus. Nat. Hist., Vol. 42, p. 404, 1920. *Worker* Monte Mandios (W. M. W.)

I have not encountered any specimens which I could positively refer to this variety. This form is only a color variation of the species and was collected by Wheeler from a high peak.

The characters given in the key to the species will serve to distinguish this ant from the typical *haematoda*.

12. *Odontomachus haematoda* var. *ruginodis* Whlr.

Bull. Amer. Mus. Nat. Hist., Vol. 21, p. 82, 1905. *Worker, Queen*

Utuaado, Adjuntas, Coamo Springs (W. M. W.); Guánica (D. L. Van D.); Rio Piedras (G. N. W.); Vieques Island (collector?)

This variety is not as common as *haematoda*. The ants differs from the latter by preferring for nesting sites open, sunny areas, especially river bottoms.

Characters given in the key will aid in distinguishing this species.

SUBFAMILY PSEUDOMYRMINAE

13. *Pseudomyrma flavidula* F. Smith.

Catalog. Hymen. Brit. Mus., Vol. 6, p. 157, 1858. *Worker* Tallaboa (W. M. W.); Lajas (H. L. D.); Las Marías, Mayagüez, and Mani Beach, 4 miles north of Mayagüez (M. R. S.)

This species usually nests in the branches and twigs of trees, the stems of plants, or occasionally in crevices beneath

bark. Colonies are not large, consisting of only a few dozen to several hundred individuals. The workers diligently run over plants in search of honey-dew excreting insects. They have been commonly noted attending the green and hemispherical scales on coffee. Undoubtedly the ants are also highly predacious.

The worker of this species can be recognized by its narrow, elongate body, exceedingly large eyes, general yellow color, and on the gaster the presence of a pair of prominent black spots near the base.

KEY TO THE SPECIES OF THE SUBFAMILY MYRMICINAE

(for the identification of workers and soldiers)

- | | |
|--|---|
| 1. Antennae 4-6 segmented ----- | 2 |
| Antennae with more than 6 segments ----- | 6 |
| 2. Antennae with 4 segments ----- <i>Epitritus emmae</i> | |
| Emery | |
| Antennae with 6 segments ----- | 3 |
| 3. Mandibles long and slender, close together at their insertions, with only two borders, an internal and an external, usually parallel or subparallel and overlapped by the clypeus only at their bases---- | 4 |
| Mandibles shorter, some distance apart at their insertions, with three borders, i. e., with the internal border differentiated into a basal and a more apical (masticatory) border, and overlapped for a considerable distance by the anterior border of the clypeus ----- <i>Strumigenys membranifera</i> | |
| subsp. <i>simillima</i> Emery | |
| 4. Inner borders of mandibles without teeth but with a series of minute denticles --- <i>Strumigenys eggersi</i> | |
| Emery | |
| Inner borders of mandibles with teeth----- | 5 |
| 5. Inner border of mandibles with a single subapical tooth ----- <i>Strumigenys louisianae</i> var. | |
| <i>obscuriventris</i> Whlr. | |
| Inner border of mandibles with two long, and approximated teeth near the apex----- <i>Strumigenys rogeri</i> Emery | |
| 6. Postpetiole articulated to the dorsal surface of the gaster, which is flattened dorsally, more convex ventrally and acutely pointed---- <i>Crematogaster steinheili</i> Forel | |
| Not as above ----- | 7 |
| 7. Workers strongly dimorphic, that is, without intermediates connecting the extreme forms; antennal | |

- club 3-segmented ----- 8
 Workers monomorphic; or else polymorphic, that is,
 with mediae intermediate between the major and
 minor forms ----- 13
8. Head very strikingly elongate and with subparallel
 sides; all parts of body except appendages smooth
 and shining ----- *Pheidole subarmata* var.
borinquenensis Whlr. 9
- Not as above ----- 9
9. Clypeus carinate, also transversely rugulose -----
Pheidole fallax jelskii var. *antillensis* Forel 10
- Not as above ----- 10
10. Entire head sculptured, opaque, except the region im-
 mediately surrounding the occipital foramen,
 which is smooth and shining ----- *Pheidole*
flavens subsp. *sculptior* Forel 11
- Only anterior three-fourths of the head sculptured,
 and opaque ----- 11
11. Antennal scrobe of the head well defined and with a
 distinct lateral carina ----- *Pheidole flavens*
 subsp. *exigua* Mayr. 12
- Not as above ----- 12
12. Anterior border of gula with two distinct teeth -----
Pheidole moerens Whlr.
 Anterior border of gula without teeth ----- *Pheidole*
megacephala Fabr. 13
13. Antennae with 10 segments, the last two segments
 forming a distinct club ----- 14
- Antennae with more than 10 segments ----- 19
14. Workers polymorphic, i. e., with major, intermediate,
 and minor forms ----- *Solenopsis geminata* Fabr. 15
- Workers monomorphic ----- 15
15. Postpetiole exceedingly large; transversely elliptical
 in shape and distinctly broader than long ----- 16
- Not as above ----- 17
16. Body jet black, with lighter appendages --- *Solenopsis*
globularia var. *desecheoensis* Mann.
 Only the posterior portion of the head, the pronotum,
 and the whole, or nearly the whole of the first
 gastric segment dark brown, in some specimens
 almost black ----- *Solenopsis globularia* var.
borinquenensis Whlr. 18
17. Entire body black and shining. *Solenopsis picea* Emery
 Not as above ----- 18
18. Clypeal border without teeth; body yellow excepting
 the posterior portion of the head and the first gas-
 tric segment which are slightly infuscated -----
Solenopsis azteca var. *pallida* Whlr.

- Clypeal border with teeth; color arrangement not as above ----- *Solenopsis corticalis* Forel
19. Epinotum unarmed ----- 20
Epinotum armed ----- 24
20. Hairs of the body appressed, scale-like; antennal foveae prolonged to the corners of the head -----
Cyphomyrmex rimosus subsp. *minutus* Mayr.
Not as above ----- 21
21. Workers polymorphic; head, though shining, with well scattered, prominent punctures -----
Monomorium destructor Jerdon
Workers monomorphic ----- 22
22. Body uniformly deep brownish black to jet black ---
Monomorium carbonarium subsp. *ebeninum* Forel
Body of a different coloration ----- 23
23. Only the head and gaster dark brown or blackish -----
Monomorium floricola Jerdon
Entire body yellow, excepting for a slight infuscation at the base of the gaster ----- *Monomorium pharaonis* Linn.
24. Body with spines or tubercles ----- 25
Body without spines or tubercles ----- 26
25. Frontal carinae very close to each other, and dilated at the anterior extremity; clypeus not distinctly prolonged back between them --- *Myrmicocrypta brittoni* Whlr.
Frontal carinae separated, embracing the posterior extremity of the clypeus ----- *Trachymyrmex jamaicensis* André
26. Clypeus armed with only two longitudinal ridges ---
Rogeria curvipubens Emery
Clypeus not as above ----- 27
27. Antennal scrobes bordered below by a carina of the cheek ----- *Wasmannia auropunctata* Roger
Antennal scrobes not bordered below by a carina of the cheeks ----- 28
28. Posterior margin of the clypeus elevated in the form of a welt or ridge bordering the antennal fossa in front ----- 29
Not as above ----- 31
29. Body black ----- *Tetramorium lucayanum* Whlr.
Body not black ----- 30
30. Head, thorax, petiole and postpetiole coarsely rugose-reticulate; hairs on thorax simple -----
Tetramorium guineense Fabr.
Sculpture finer: hairs on thorax short and clavate ---
Tetramorium simillimum F. Smith

31. Antennae 11-segmented, frontal carinae close to each other and dilated at the anterior extremity-----
Mycocepurus smithi var. *borinquenensis* Whlr.
 Antennae 12 segmented; frontal carinae neither closely approximated nor dilated anteriorly ----- 32
32. Middle and hind tibiae without spurs; petiole with long cylindrical peduncle and a broad oval node; post-petiole unusually large; body hairs simple----- 33
 Not presenting all the above characters; either the spurs present, or the body hairs clavate ----- 34
33. Size 2.2 to 2.5 mm.; head black----- *Cardiocondyla venustula* Whlr.
 Size smaller; head light reddish brown; antennal scapes infuscated toward the tips-*Cardiocondyla emeryi* Forel
34. General body color blue-black ----- 35
 Only the head, coxae, femora, and gaster blue-black-- 36
35. Legs only slightly darker (fuscous) than the remainder of the body; size 2 to 2.5 mm.---*Macromischa albispina* Whlr.
 Legs much paler (yellowish white); size 1.5 mm.-----
Macromischa albispina subsp. *pallipes* Mann
36. Epinotum spined ----- *Macromischa isabellae* Whlr.
 Epinotum unarmed ----- *Macromischa isabellae mutica* subsp. nov.

SUBFAMILY MYRMICINAE

14. *Monomorium carbonarium* subsp. *ebeninum* Forel.

Mitth. Munch. Entom. Ver., Vol. 5, p. 8, 1881. *Worker*

Culebra (W. M. W.); Santurce, Utuado, Coamo Springs, Aibonito, Adjuntas, Arecibo, Vega Baja (W. M. W.); Guánica, San Sebastián (G. N. W.); Mayaguez, Lares, Las Marías (M. R. S.)

This is one of the most common ants of the West Indies. It occupies the same status in these Islands that *M. minimum* Buckley does in the United States. It forms populous colonies, which are characterized by having many reproductive queens to a colony. Their great adaptability is indicated by the fact that the species nests in both soil and wood, back of the leaf sheaths or corn and bananas, in cabbage heads, Tillandsias, and in the fruits of *Hibiscus sabdariffa*. The workers are exceedingly fond of honeydew. They have been noted attending such insects as *Saissetia hemispherica* Targ., *Coccus viridis* Green, the aphid *Sipha flava* Forbes, etc. The ants are also highly predacious.

Although they have not been observed infesting houses, there is little doubt that they would do so if given the opportunity.

The worker is easily recognized by its shining black or deep brownish color, 3-segmented antennal club, lack of epinotal spines, and cuboidal shaped epinotum.

15. *Monomorium destructor* Jerdon.

Madras Jour. Lit. and Sci., Vol. 17, p. 105, 1851. *Worker* Tallaboa (W. M. W.); Guayama, Sabana Grande, Ponce (H. L. D.); Mayaguez and Ensenada (M. R. S.)

The indications are that this species is an imported ant. Should an intensive search be made for it, the ants would probably be found in many of the seaport towns, if not elsewhere. At Mayagüez the species was found nesting in a bakery where the ants made numerous trails on the walls and floors, composed of enormous numbers of workers. Dealtated queens have been seen moving along in the trails with the workers. The colonies of *destructor* must be composed of thousands of individuals if one is to judge from the number and size of their trails. Like *M. ebeninum*, they are polygynous. An inmate of the bakery said the ants were fond of sweets and meats, but did not seem to care for flour or lard. In a very dry and arid pasture at Ensenada the ants were found nesting in the soil at the base of trees and also in the soil under rocks. Workers have frequently been noted attending soft scales, psyllids, and other honeydew-excreting insects. They are also highly predacious.

Workers can be recognized by their yellowish color, their shining bodies, and by the fact that they are highly polymorphic.

16. *Monomorium floricola* Jerdon.

Madras Journ. Lit. and Sci., Vol. 17, p. 107, 1851. *Worker* Culebra (W. M. W.); Vega Baja, Coamo Springs, Tallaboa (W. M. W.); Lares, Peñuelas, Sabana Grande, San Germán, Humacao, Caguas (G. N. W.); Mayaguez, Ceiba Baja (M. R. S.)

This ant, unlike the two preceding species, seems to prefer wood for nesting purposes. Moderate-sized colonies have been noted in the twigs of trees, beneath the bark of trees, etc., and in Tillandsias. Like the other species of this genus *floricola* has many reproductive queens per colony. This species is also

noted for producing ergatoid females, that is, females which were apparently never meant to be winged. The workers are exceedingly fond of honeydew as well as organisms. I have commonly seen the ants attending the green and hemispherical scales on coffee. The workers of this species made themselves quite objectionable by stealing insects for food from our insectary.

The worker of *M. floricola* is quite easy to distinguish by its 3-segmented antennal club; lack of epinotal spines; dark head and gaster, with light-colored thorax; and its general glabrous appearance.

17. *Monomorium pharaonis* Linn.

Syst. Natur., Ed. 10, p. 580, 1758. *Worker*.

Culebra (W. M. W.); San Juan, Arecibo (W. M. W.); Mayagüez, (M. R. S.)

This imported species, which is rapidly becoming disseminated over the entire world, has not yet been recorded many times from the Islands of the West Indies. This may be due to lack of a sufficient search for it. The ant, which is commonly known as "Pharaoh's" ant, is highly adapted for living in urban areas, where its very populous colonies nest in the woodwork and masonry work of dwellings, stores, etc. Like other species of *Monomorium*, its colonies are polygynous. The ants are practically omnivorous in their feeding habits. In a country with as mild a climate as Puerto Rico this ant should be capable of living outdoors as well as inside dwellings.

The worker, which is of a pale yellowish color, is characterized by its lack of epinotal spines, presence of a 3-segmented antennal club, and punctate and subopaque appearing body. The gaster is distinctly infuscated near the base.



Fig. 1. *Cardiocondyla emeryi* Forel (After Wheeler.)

18. *Cardiocondyla emeryi* Forel

Mit. Munch. Entom. Ver., Vol. 5, p. 5, 1881. *Worker*

Vieques (Busck); Culebra (W. M. W.); San Juan, Santurce, Utuado, Adjuntas, Coamo Springs (W. M. W.); Sabana Grande, Lajas (H. L. D.); Tres Hermanos, Mani Beach, Mayagüez, Guánica, Ensenada (M. R. S.)

This is a very common species of ant in the West Indies, as numerous records indicate. It is also recorded from India, Palestine, Madagascar, Florida, etc. Due to the extremely small size of the worker and its habit of commonly foraging alone, the species is easily overlooked by the collector. Wheeler states that "the colonies of this ant are small and occur in sandy places, especially in river or creek bottoms and on sea beaches." While it is true that they are commonly found in such habitats the species in Puerto Rico is by no means confined to such areas, for I have found them nesting in clay soils considerably removed from stream beds. Their nest entrances are extremely small and may easily be overlooked. On a number of occasions workers have been collected from cow dung. Undoubtedly the ant is highly predacious, but it is also given to attending honeydew-excreting insects to some extent.

The worker is recognized by its distinctive coloration, all of the body being light reddish brown except the gaster and the antennal club. The worker differs from that of *C. venustula* in its more angular thoracic humeri, more slender petiole, difference in coloration, size, etc.

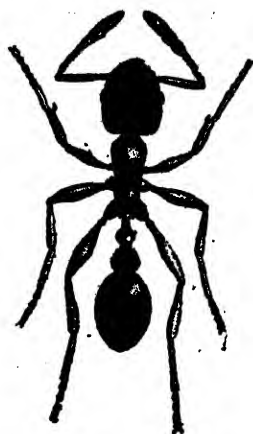


Fig. 2. *Cardiocondyla venustula* Wheeler. (After Wheeler.)

19. *Cardiocondyla venustula* Whlr.

Bull. Amer. Mus. Nat. Hist. Vol. 24, pp. 128-130, 1908.

Worker, Queen.

Culebra (W. M. W.); Coamo Springs (W. M. W.); Ponce, Guayama, Coamo (H. L. D.); Mayagüez (M. R. S.)

This species is apparently not so common as the preceding in Puerto Rico or in any of the other West Indian Islands.

Wheeler, who described *venustula* from Puerto Rican specimens in 1908, remarks that the ant "is not uncommon in sandy and gravelly places, especially on the sea-beaches, where it lives in small colonies, comprising a single dealated queen and a few dozen workers, in shallow nests like those of some species of *Leptothorax*." He noted winged females on March 23.

Dozier collected workers on several occasions from dry cow dung in very arid pasture areas at both Ponce and Coamo. Nothing is known concerning the food of these ants but they are thought to be mainly predacious.

The worker of *venustula* may be distinguish from that of *C. emeryi* by its larger size (2.0-2.5 mm.), rounder thoracic humeri, broader petiole, and darker and more opaque appearance.

20. *Solenopsis azteca* var. *pallida* Whlr.

Bull. Amer. Mus. Nat. Hist., Vol. 24, p. 131, 1908. *Worker* Coamo Springs (W. M. W.); 14 kilometers east of Mayagüez (M. R. S.)

Wheeler found this ant nesting in the soil beneath a boulder in a dry stream bed. The specimens which I have referred to this species were quite common in stumps and logs in a coffee grove. They were usually found just beneath the bark. Winged queens were noted on December 13.

My specimens agree with Wheeler's brief characterization of the workers as having a yellowish body, with the vertex of the head and the first gastric segment slightly infuscated, and the presence of two well-developed clypeal carinae, but no teeth on the clypeal border.

21. *Solenopsis corticalis* Forel.

Mitth. Munch. Entom. Ver., Vol. 1, p. 13, 1881. *Worker, Queen.*

Utuado (W. M. W.); 16 kilometers east of Mayagüez, Lajas (M. R. S.)

This species is recorded by Wheeler as having been found nesting in the stem of a bamboo. I have referred to *corticalis* specimens collected from clay soil at an altitude of 650 feet. Workers have also been noted attending the pineapple mealybug. The species is not recorded from any of the other West Indian Islands except St. Thomas.

Very little is known concerning the biology of the ant.

22. *Solenopsis picea* Emery.

Bull. Soc. Ent. Ital., Vol. 28, p. 1896. *Worker Queen.*

Utuado (W. M. W.)

This ant is recorded only from Cuba and Puerto Rico. A single colony was found by Wheeler nesting under the bark of a rotting log.

As the name indicates, the worker is very dark, and glabrous, differing thus from the other monomorphic forms mentioned in this paper, with which it might be confused.

I have no information on the biology of the species.

23. *Solenopsis geminata* Fabr.

Syst. Piez. No. 6, p. 423, 1804. *Worker*.

Culebra (W. M. W.); Arecibo, Adjuntas, San Juan, Santurce, Vega Baja, Utuado, Monte Morales, Monte Mandios, Coamo Springs, Ponce, Tallaboa (W. M. W.); Guánica, Lajas, Ponce, Ensenada (H. L. D.); Mayagüez, Juana Díaz, Tres Hermanos, Maricao Insular Forest, etc. (M. R. S.)

The "hormiga brava" is not only one of the most common ants in Puerto Rico, but also of the entire West Indies. It is perhaps better known by the natives than any other ant. Their encounters with this vicious and aggressive ant have not only resulted in their respecting it but also in giving it the name "brave ant". I have seen colonies of this ant from sea level to an altitude of approximately 3,000 feet. Although this ant prefers to nest in open sunny places, its nests on some occasions are found in lightly shaded woods. The typical nest is a mound of loose earth with several entrances leading into it, but the ants may nest in the soil beneath cow dung or in other places. Their colonies are composed of thousands of individuals. Fertile, dealated queens are capable of starting colonies unaided.

This is one of the most versatile ants known. The workers are noted for their predaciousness, as well as for their love of seeds, the juices or sap of plants, and honeydew. To one who has lived in Puerto Rico it would seem that there are very few plant lice, soft scales, mealybugs, etc., that these ants do not attend. The fostering attitude shown by the worker toward the pineapple mealybug (*Pseudococcus brevipes* Cockl.) makes it a very serious problem in combating the latter insect. The "hormiga brava" is without doubt the most important ant pest in the island for the following reasons: (1) its vicious stinging habit, (2) the stealing of small seeds from seed beds, (3) the attendance on and fostering care exhibited toward honey-dew excreting insects, (4) its habit of gnawing into plants, fruits, and trees. It is also presumed that the ants may gnaw holes in clothing, kill young poultry or birds as these emerge from the egg, and invade houses as does the fire ant (*Solenopsis xyloni* McC.) in the southern part of the United States.

Several specimens of a phorid fly, *Pseudaceton antiguense* Cwfd., were captured around the nest of a colony of this ant at a locality 17 kilometers east of Mayagüez.

The worker of the fire ant is polymorphic, is highly variable in color, ranging from reddish brown to black, glabrous, possesses a 2-segmented antennal club, and has no epinotal spines.

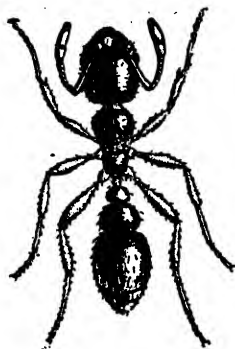


Fig. 3. *Solenopsis globularia* var. *borinquenensis* Whlr.
(After Wheeler.)

24. *Solenopsis globularia* var. *borinquenensis* Whlr.

Bull Amer. Mus. Nat. Hist., Vol. 24, p. 131, 1908. *Worker*
Culebra (W. M. W.); *El Morro* at *San Juan* (W. M. W.)

Wheeler, who described this variety from specimens gathered at the above-named localities, states that it "nests in the white sand of the sea beaches just above the high water mark." Although I have collected ants on numerous occasions in such places, these specimens have apparently been too dark for me to refer them to *borinquenensis*, so I have assigned them to the following species instead.

This ant has been recorded from Santo Domingo as well as Haiti.

The worker is distinguished from that of the typical species in that the posterior portion of the head, the pronotum, and the whole or nearly the whole of the first gastric segment are dark brown, in some specimens almost black.

25. *Solenopsis globularia* var. *desecheoensis* Mann.

Bull. Amer. Mus. Nat. Hist., Vol. 42, p. 428, 1920. *Worker* Desecheo Island (W. M. W.); Ensenada, Lajas, Lake Guánica, Coamo (H. L. D.); Mayagüez (M. R. S.)

This species was described by Mann from specimens collected on Desecheo Island, with no remarks given as to their nesting habits or biology.

Many specimens have been taken by Dozier from cow dung in dry, arid cattle pastures at the above-named localities. I have also taken workers on several occasions along the sandy beach at Mayagüez, only 10 feet or so from the Caribbean Sea. These were thought to be nesting in the soil, but I was unable to locate their nests definitely. One would judge that their colonies are not very populous, comprising perhaps only a few hundred individuals. The ants are undoubtedly largely predacious. The workers crawl very slowly and usually forage singly.

Mann states that the worker of this variety differs from that of *globularia* in having a jet black body and (yellowish brown) appendages.

26. *Pheidole fallax jelskii* var. *antillensis* Forel.

Mitth. Munch. Ent. Ver., Vol. 1, p. 4, 1881. *Worker*.

Culebra (W. M. W.); Utuado, Monte Morales, Monte Mandios, El Morro at San Juan, Santurce, Coamo Springs, Vega Baja (W. M. W.); Tres Hermanos, Mayagüez, Hormigueros, Ensenada, Maricao Insular Forest, Juana Díaz (M. R. S.); Toa Baja, Yauco, Río Piedras (G. N. W.); Lajas, Sabana Grande, Ponce, Coamo, Humacao (H. L. D.)

This is not only one of the most common ants in Puerto Rico but also in the entire West Indies. I have seen colonies in Puerto Rico from sea level to approximately 3,000 feet altitude. The fairly populous colonies are usually found in open, sunny areas regardless of whether these be bare or grassy. The nest can be easily recognized by the peculiar elongate, slit-shaped entrance holes. The ants are so versatile that they even nest in the cracks of pavement, the crannies of masonry work, etc. The rather large, slender workers of this species can be observed bringing into the nest literally hundreds of insects and other

organisms. Their food is largely flesh, and so strongly does this predominate that the ants have a distinct fecal odor. Workers have been collected very frequently from dung, and it is believed that the ants live to a large extent on the insects that inhabit this material. I have noted the workers on several occasions attending the green and hemispherical scales, the aphid, *Pentalonia nigronervosa* Coquerel on bananas, etc., thus indicating that the diet of this ant is not entirely flesh. A. H. Madden found both workers and soldiers in the stomach of the Surinam toad, *Bufo marinus*.

On August 14 queen pupae were noted in a colony, and on December 18 winged males and winged queens.

The soldier of *Ph. antillensis* is easily distinguished from the soldiers of other Puerto Rican species of *Pheidole* by its large size and reddish-brown body. The head of the soldier is very coarsely rugulose-recticulate and subopaque.

27. *Pheidole flavens* subsp. *exigua* Mayr

Horae Soc. Entom. Ross., Vol. 18, p. 36, 1884. *Soldier*

Utuaado, Monte Mandios, Coamo Springs (W. M. W.); 14 kilometers east of Mayagüez, (M. R. S.); Cayey (G. N. W.)

This species is apparently not so common in Puerto Rico as some of the other forms of the genus. So far it has not been recorded from any of the other West Indian Islands. Wheeler found colonies of this ant nesting in the soil beneath stones and logs in coffee groves. I have noted the ants on two occasions in a similar habitat nesting in rotten stumps and also in the ground at the base of a stump. The colonies appear to be very small, being composed of only a few hundred individuals. The ants are without doubt principally flesh feeders.

The soldier of *exigua*, as its specific name indicates, is easily recognized by its distinct antennal scrobe, which is set off from the remainder of the head by a well-defined lateral carina. The anterior three-fourths of the head is subopaque; the color of the head, thorax, and pedicel is pale reddish brown. The queen is unusually small and dark colored.

28. *Pheidole flavens* subsp. *sculptior* Forel

Trans. Ent. Soc. Lond., p. 414, 1893. *Soldier, Worker, Queen*

Coamo Springs (W. M. W.); 4 miles east of Mayagüez, 6 miles southeast of Mayagüez (M. R. S.)

Small colonies of this ant have been found on a number of occasions in rotten stumps in coffee groves. A colony was also collected from the sandy soil of the beach beneath a coconut husk. The food habits of this ant are probably the same as those of the preceding species. Winged queens were found in colonies on August 23, September 20, and October 4. Winged males were noted in similar circumstances on August 14 and October 14.

The characters mentioned in the key to the species will serve to distinguish the soldier of this ant from that of the soldier of other species of *Pheidole*.

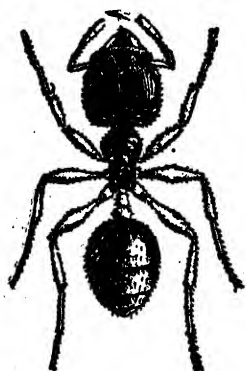


Fig. 4. *Pheidole moerens* Wheeler: soldier. (After Wheeler.)



Fig. 5. *Pheidole moerens* Wheeler: worker. (After Wheeler.)

29. *Pheidole moerens* Whlr.

Bul. Amer. Mus. Nat. Hist., Vol. 24, p. 136-137, 1908. *Soldier, Worker*

Culebra (W. M. W.); Utuado, Monte Morales, Monte Mandios (W. M. W.); Ponce, Coamo (H. L. D.); Yauco, Mayagüez, Maricao Insular Forest (M. R. S.)

Although this is one of the commonest species of *Pheidole* in Puerto Rico, it has not yet been recorded from any of the other West Indian Islands. I have found it especially abundant in the hills and mountains, particularly in coffee groves. The species has been taken at altitudes as high as 3,000 feet. The small colonies of *moerens* may be found in the soil beneath stones or logs, or in the wood of logs and stumps. Often the ants nest in the very soft, moist wood. None of the soldiers and workers have been observed attending scales and plant lice, hence it is inferred that the ants are principally if not exclusively flesh feeders. Winged males were seen in a colony on November 21, and both winged males and winged queens on March 24.

The soldier can be recognized by the posterior fourth of the head being smooth and shining, the gula having two prominent teeth, the prothorax transversely rugulose, and the dorsal surface of the postpetiole glabrous.

30. *Pheidole megacephala* Fabr.

Ent. Syst. Vol. 2, p. 361, 1793. *Soldier*

Culebra (W. M. W.); Aibonito, Arecibo, Mayagüez (W. M. W.); Río Piedras, Cayey (G. N. W.); Mayagüez (M. R. S.)

This imported species, so far as I know, is confined to the towns in Puerto Rico. Undoubtedly the ants occur in many more localities than are mentioned above. The species is also well scattered throughout the West Indian Islands. I found the ants in my back yard nesting in the soil beneath stones and in cracks beneath the concrete walks. On numerous occasions they were noted foraging in the kitchen. On the roots of the grass *Eleusine indica* they were noted attending the pineapple mealybug (*Pseudococcus brevipes*). The ants are fond of honeydew in spite of their love for flesh. A colony has numerous fertile queens in it, thus accounting for its populousness. *P. megacephala* is apparently a mortal enemy of the "hormiga brava", as these two species have been seen fighting on numerous occasions.

On January 28 many winged males were noted in a colony.

The soldier is recognized by its exceedingly large head, almost the entire posterior half of which is smooth and shining.

the gula has no teeth, the epinotal spines are acute, and the postpetiole is sharply conulate on the sides; the color is a deep brown, with the apical section of the gaster darker.



Fig. 6. *Pheidole subarmata* var. *borinquensis* Wheeler: soldier. (After Wheeler.)

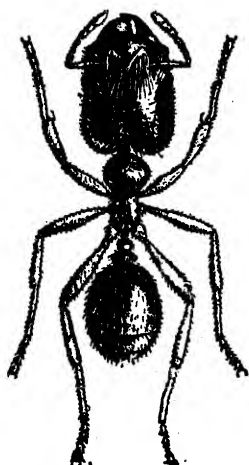


Fig. 7. *Pheidole subarmata* var. *borinquensis* Wheeler: soldier. (After Wheeler.) Fig. 8. *Pheidole subarmata* var. *borinquensis* Wheeler: worker. (After Wheeler.)

31. *Pheidole subarmata* var. *borinquensis* Whlr.

Bull. Amer. Mus. Nat. Hist., Vol. 24, p. 133-134, 1908.
Soldier, Worker.

El Morro at San Juan, Santurce, Utuado (W. M. W.); Hatillo, Lajas, Sabana Grande (H. L. D.); Mayagüez, Juana Diaz, Tres Hermanos, Lares (M. R. S.)

This rather common species of Puerto Rican ant has not yet been recorded from any of the other West Indian Islands. Wheeler states that the formicaries "are small craters thrown up in sandy, sunny places like roads and creek bottoms." He

also remarks that there are only a few soldiers and workers in a colony. I have found the ants nesting in both clay and sandy soils. Madden noted the soldiers and workers feeding on the eggs and nymphs of the mole cricket *Scapteriscus vicinus*. Latr. He also took these ants from the stomach of the Surinam toad. Dozier found the soldiers and workers quite common in cow dung. I have noted the ants attending the pineapple mealybug, the aphid *Pentalonia nigronervosa* on plantain, the green and the hemispherical scales, etc.

The soldier of this species is very easily distinguished by its very elongate head, the borders of which are subparallel; the considerably elevated frontal carinae and the smooth, glabrous surface of the body.

32. *Crematogaster steinheili* Forel

Mitth. Munch. Entom. Ver., Vol. 1, p. 15, 1881. *Worker*

Culebra (W. M. W.); Coamo Springs, Vega Baja, Aibonito (W. M. W.); Guayama (J. D. M.); Fajardo (G. N. W.); Ensenada, Mayagüez, San Germán, Lajas, Guánica (M. R. S.)

C. steinheili is the only species of *Crematogaster* that has been taken in Puerto Rico to date. It is not only a fairly common ant in Puerto Rico but it is also common in many of the other West Indian Islands. Colonies which are moderately populous and contain many fertile queens are found in rotten wood, in cavities in twigs of plants, under the bark of trees, at the base of and between the leaf sheaths of Tillandsias, etc. On one occasion a nest was found in the soil beneath a rock. I have found the ants in some of the driest areas of the island as well as some of the most moist, hence am led to conclude that it is a highly adaptable species.

The workers are exceedingly fond of honey-dew. They have been noted on numerous occasions attending mealybugs, soft scales, and plant lice. It is a very common custom with this species to build a carton like covering over the insects which they are attending. Many of the honey-dew excreting forms attended are economic species, such as a *Aphis gossypii* Glov., *Pseudococcus nipae* Mask., *Ps. brevipes*, and *Toxoptera aurantiae* Koch. The ants are probably flesh feeders also. When alarmed the worker has the habit of turning up the posterior portion of its gaster, like many of the other ants of the genus.

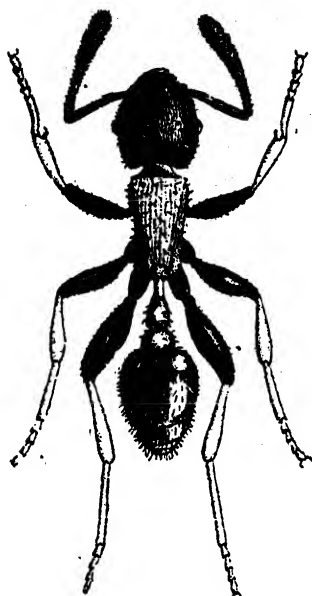


Fig. 9. *Macromischa isabellae* Wheeler (After Wheeler.)

33. *Macromischa isabellae* Whlr.

Bull. Amer. Mus. Nat. Hist., Vol. 24, pp. 138-139, 1908.
All castes.

Monte Morales, Monte Mandios (W. M. W.) ; Lares, Yauco, (F. Sein) ; Las Mesas near Mayagüez (M. R. S.)

This beautiful species is one of the few members of the genus found in Puerto Rico, although the ants are very common in other West Indian Islands, especially Cuba. There seems to be little doubt that *M. isabellae* prefers high elevations for its nesting sites and thrives best in rather densely wooded areas. The ants have been noted at altitudes ranging from about 800 to 3,000 feet. Wheeler found the colonies very small and the ants nesting in a hollow twig and under the roots of an epiphytic orchid. Wolcott records them as nesting in an old stump. I found a colony comprising perhaps 75 to 100 individuals nesting in a branch of a tree in galleries and chambers that may have been previously constructed by some wood-boring beetle. The workers have a habit at times of bending the gaster down-

ward and forward between the legs in a very peculiar manner. When one sees such an ant it immediately gives the false impression that the ant has been unfortunate enough to lose its gaster. Nothing is known concerning the food of the ant, although the species is an arboreal type. Careful examinations of workers from a single colony show that the length of the epinotal spines of this species is highly variable, a point that has much taxonomic significance in reference to the status of several subgenera which have been created for these taxonomically perplexing ants.

Sein took winged males of this ant at Yauco on August 24 I have seen both winged males and male pupae in a nest near Mayagüez on March 15.

The peculiar and beautiful color markings of the worker of this species easily distinguishes it from any other Puerto Rican ant.

34. *Macromischa isabellae mutica* subsp. nov.

Maricao Insular Forest.

Worker: Length 3.5 to 3.7 mm.

Head rectangular, distinctly longer than broad, sides subparallel, posterior border very faintly emarginate, and eyes slightly in front of the middle. Mandibles 5-toothed. Antennal scapes extending a slight distance beyond the posterior angles of the head; segments 3 to 7 of the funiculus apparently broader than long, the terminal segment as long as the two preceding segments taken together. Thorax considerably less than three times as long as broad; broader in front than behind, and with a straight, transverse carina on the pronotum ending on each side in the angular humerus. In lateral profile the thorax is without sutures and terminates posteriorly in a well-arched epinotum that is devoid of any trace of spines. Petiole from above not more than twice as long as broad, pedunculate, gradually broadening behind; in profile the anterior surface of the node is slightly concave, the posterior surface slightly convex, and the node well rounded and high. Postpetiole, from above, very distinctly broader than long, nearly as broad in front as behind. Gaster small. Legs long, femora incrassated and increasing in size from the first to the third pair.

Opaque; gaster glabrous. Mandibles with coarse longitudinal striations. Clypeus, head, thorax, petiole, and postpetiole very finely and densely punctate, thus giving these parts a velvety appearance. Clypeus, head, and thorax with faint longitudinal rugae, the rugae on the thorax farther apart than those on the head.

Hairs whitish; sparse, more prominent on the head, thorax, petiole, postpetiole, and gaster, more slender and appressed on the appendages.

Head, antennae, coxae, femora, and gaster blue-black. Thorax, petiole, and postpetiole dull orange red; tips of mandibles, tibiae, tarsi, and two elliptical spots at the base of the first gastric segment yellow.

Described from 19 workers collected at the Maricao Insular Forest on August 18, 1935, at an altitude of 3,000 feet. Cotypes in the collections of the United States National Museum and the writer.

The worker of this new subspecies can be distinguished from that of *isabellae* by the following characters:

- (1) absence of epinotal spines, hence the specific name, *mutica*,
- (2) head with a faintly emarginate posterior border,
- (3) petiole not more than twice as long as broad,
- (4) thorax lacking considerably of being three times as long as broad, and
- (5) petiole with a faint ventral tooth anteriorly.

This new subspecies is of more than ordinary interest in that it sheds considerable light on the taxonomic status of several subgenera formerly proposed for this perplexing group of ants. Roger recognized the variable characters of these ants when he erected the genus *Macromischa* for them, thus indicating by the name of the genus that the species included under it were very diverse, or a large mixture of variable forms.

In 1920 Mann made a very creditable attempt to clarify the situation by taking all the known forms of *Macromischa* and dividing them into three subgenera: (1) those with unarmed epinota and elongated petiolar peduncles, subgenus *Croesomyrmex*, (2) those with rectangular heads and short

peduncles to the petiole, subgenus *Antillaemyrmex*, and (3) those remaining, subgenus *Macromischa* sensu strictu. Wheeler in 1931 went so far as to elevate the subgenera *Croesomyrmex* and *Antillaemyrmex* to distinct genera, although he states that the status of the two is perhaps doubtful "because at least one species of *Macromischa* sensu str., namely *pastinifera* Emery, is terricolous, according to Creighton, and one species of *Antillaemyrmex* (*floridanus*) lives in twigs, and because the species *melanocephala* is very much like an *Antillaemyrmex*, except in the shape of the petiole."

Thus, the finding of the new subspecies *mutica* described above again complicates the situation regarding the forms of *Macromischa* and would seem to indicate that the characters suggested for these subgenera or genera (according to whether one considers Mann's interpretation or that of Wheeler's) are too highly variable and elusive, and it is better, once again, to consider all species of *Macromischa* as belonging to a single genus.

My examinations of many specimens of *M. isabellae* collected from a single colony in Puerto Rico show that the amount of development of the epinotal spines is highly variable among these specimens. The finding of *mutica*, however, shows the absolute futility of retaining the subgenera *Macromischa* and *Croesomyrmex*, since worker specimens of Wheeler's *isabellae* would fall, because of their spined epinotum and slender pedicel, into the subgenus *Macromischa*, and the worker of *mutica*, because of their unarmed epinotum, into the subgenus *Croesomyrmex*. This condition could never exist, since we have here the peculiar anomaly of having the primary form (*isabellae*) falling into one subgenus and that of its variant or derivative (*mutica*) into another subgenus. For these reasons I would propose that all subgenera of *Macromischa* be dropped and all the species in it retained in an undivided genus until a better classification can be provided.

The habits of this new form are so similar to those of the preceding species that they need not to be discussed in detail here. On several occasions the ants have been collected in the Maricao Insular Forest at an altitude of approximately 3,000 ft. Here workers were collected from the surface of the ground and from the trunks of trees as they were foraging singly. Not only do the workers have the same habit of tucking the gaster

beneath the body as with *M. isabellae*, but also when disturbed they crouch down on a surface and remain very quiescent. A small colony was found in the soil beneath a stone. Callows in this nest were noted to carry immature stages around in their mouths, exactly like the fully developed workers.

Nothing is known concerning the feeding habits of these ants.

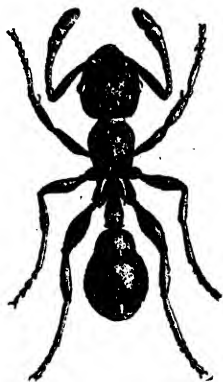


Fig. 10. *Macromischa albispina* Wheeler (After Wheeler.)

35. *Macromischa albispina* Whlr.

Bull. Amer. Mus. Nat. Hist., Vol. 24, pp. 139-140, 1908.
Worker, Queen.

Culebra (W. M. W.)

This species has been taken only once in the West Indian Islands, and that time from Culebra, a small Island off the southeast coast of Puerto Rico. It was described in 1908 by Wheeler from specimens taken nesting "in a small cavity in the ground in the shade of a thicket, where some of the workers were moving about slowly over dead leaves and twigs."

Very little is known of biology of this ant, except that the colonies are small and inhabit the soil. It is inferred that the workers are flesh feeders.

The worker is characterized by a general blue-black body color and very distinctly white epinotal spines. The color of the latter suggested the very typical specific name *albispina*.

36. *Macromischa albispina* subsp. *pallipes* Mann.Bull. Amer. Mus. Hist., Vol. 42, p. 424, 1920. *Worker, Queen*

Mona Island (Mann)

First described by Mann from Mona Island of the coast of Puerto Rico as a variety of *M. albispina*, this ant was later raised to subspecific status by Wheeler. The latter states that the worker and queen of *pallipes* are smaller than those castes of the species. He also remarks that the worker of *pallipes* has the legs, antennal scapes, and mandibles yellowish white, and petiolar node distinctly smooth and shining. The antennal funiculi are slightly brownish.

The biology of *pallipes* is very probably similar to that of the species.

37. *Rogeria curvipubens* Emery.Bull. Ent. Soc. Ital., Vol. 26., p. 54, 1894. *Worker Queen.*

Ensenada (M. R. S.)

I have referred to this species a single specimen that was captured from the soil beneath a rock in a dry pasture of one of the most arid areas of the Island. Although I hunted assiduously for other specimens, none could be found.

R. curvipubens has also been collected in the Bahamas, Cuba, and the Virgin Islands. It is apparently a rare ant on the western end of the Island of Puerto Rico.

Nothing is known of the biology of this ant, but it is believed that it forms very small colonies, is subterranean in habits, and is largely a flesh feeder.

The worker, which is less than 2 mm. in length, is of a dark reddish-brown color. The antennae are 12-segmented, the clypeus carinate, the eyes extremely small, the epinotum bispinose. I could not detect any spurs on the hind tibiae. The affinities of this ant seem to lean strongly to those of *Stenammas*.

38. *Tetramorium guineense* Fabr.Entom. Syst., Vol. 2, p. 357, 1793. *Worker.*

Culebra (W. M. W.); Hatillo, Humacao (H. L. D.); Yabucoa (G. N. W.); Mayagüez, Mani Beach near Mayagüez (M. R. S.)

This introduced species is undoubtedly much more widely distributed in Puerto Rico than the above records would indicate. One would expect to find the ants most commonly in the towns, especially those that are seaports. *T. guineense* is also very widely distributed throughout many of the other West Indian Islands. Several colonies of this species became established in one of our insectaries and gave considerable trouble by feeding on the larvae and pupae of the West Indian fruit fly, as well as some of the other insects. I found a colony of this ant nesting in a rotten coconut log near the beach. Winged males were noted in this nest on September 17. Colonies of this ant apparently do not number over several hundred individuals. The workers feed on flesh as well as on honeydew. On a number of occasions they have been taken from cow dung. Although this species has not been noted infesting houses in Puerto Rico, there is little doubt that it would if the opportunity were given. Wheeler records it as feeding on a broken papaya.

The very coarse, rugose-reticulate sculpturing of the head, thorax, petiole, and postpetiole of the worker, and its larger size, help to distinguish it from the worker of the following species of *Tetramorium*.

39. *Tetramorium lucayanum* Whlr.

Bull. Amer. Mus. Nat. Hist., Vol. 21, pp. 100-101, 1905.
Worker.

Mayagüez, 4 miles from Mayagüez (M. R. S.)

This species, first described by Wheeler from specimens taken in the Bahamas, has since been taken from Cuba and Haiti and will probably be found to occur in many of the other West Indian Islands.

Mann records this species as nesting in the soil in small colonies beneath stones. I found a colony of *lucayanum* nesting beneath the bark of an old guaba stump very near the base, in a coffee grove, only a few miles from Mayaguez. Specimens of this ant have also been collected from a crack in the concrete floor of a barn on the Puerto Rico Agricultural Experiment Station grounds. *T. lucayanum* is probably the only species of the genus that is native to the island. Almost nothing is known of the biology of this ant. It is believed that the workers feed mainly on flesh.

The worker is distinguished from those of the other members of the genus here mentioned by its very characteristic, quadrangular (when viewed in lateral profile) petiole, its black, shining body, and its size (2.25-2.5 mm.).

40. *Tetramorium simillimum* Nylander

List Brit. Animals, Brit. Mus., part 6, p. 118, 1851. *Worker* Culebra (W. M. W.); Coamo Springs (W. M. W.); Lajas, Guayama, Ponce, Sabana Grande (H. L. D.); Tres Hermanos, Mayaguez, Ensenada (M. R. S.)

This introduced species is very commonly distributed throughout many of the West Indian Islands and is perhaps much more widely distributed in Puerto Rico than the above records would indicate. Workers have been collected on a number of occasions from cow dung in pastures in the very dry areas of the Island, also on sandy beaches in the more moist areas. The ants are capable of nesting in the soil or in wood. The workers are thought to be highly predacious, although they attend honeydew-excreting insects to some extent.

The worker can be distinguished from that of the other members of the genus by its very small size, and by the short, distinctly clavate hairs on the thorax, the very short epinotal spines, and the feebler sculpturing of the body.



Fig. 11. *Wasmannia auropunctata* Roger (After Wheeler.)

41. *Wasmannia auropunctata* Roger.

Berl. Ent. Zeitschr. Vol. 7, p. 182, 1863. *All castes*

Culebra (W. M. W.); Utuado, Monte Morales, Monte Mandios, Adjuntas, Coamo Springs, El Morro at San Juan, Vega Baja (W. M. W.); Ciales (Van Z.); Quebradillas (G. N. W.); Guánica (H. L. D.); Río Piedras (J. D. M.); 14 kilometers northeast of Ponce, Lajas, Lares, San Sebastian, Arecibo, Juana Díaz (M. R. S.)

This ant, which is known as the "albayalde" by the natives, is one of the most common of all the Puerto Rican ants. It is also very generally distributed throughout the West Indies. The natives claim that the sting is dreaded by them even more than that of the "hormiga brava" because it is much more lasting. Also, owing to the small size of the workers, the ants can conceal themselves in one's clothing and not be so easily detected. Colonies are very populous and may be found either in the soil or in rotten logs and stumps. Although the "albayalde" is one of the most common ants in densely shaded areas such as coffee groves, it also occurs in open pastures, sandy beaches, etc., and lives in the very arid regions of the Island as well as in the more moist areas.

As an attendant on honeydew-excreting insects the ant is scarcely surpassed, unless it be by the "hormiga brava." Workers have been noted on numerous occasions attending the green and hemispherical scales; the mealybugs *Pseudococcus brevipes*, *Ps. sacchari* Ckll., and *Ps. virgatus* Ckll.; and the aphids *Toxoptera aurantiae*, *Sipha flava*, and *Pentalonia nigronervosa*. Their food probably consists of a great deal of flesh also. Van Zwaluwenberg is the authority for the statement that this ant often kills out and displaces colonies of the "hormiguilla" *Myrmelachista ramulorum* Whlr., in coffee groves. On March 18, male and queen pupae were found in a colony.

The small worker is recognized by its prominent antennal scrobe which not only extends to the posterior border of the head but is bordered laterally just above the eyes by a carina; the very prominent, angular, thoracic humeri; and by the elongate, acute, epinotal spines; as well as by its general light yellowish-brown color.

42. *Strumigenys eggersi* Emery.

Bull. Soc. Ital., Vol. 22, p. 32, 1890. *Worker, Queen.*

Juana Díaz (J. W. Balock); Mayagüez, Maricao Insular Forest (M. R. S.)

S. eggersi does not seem to be as common a species in Puerto Rico as *S. rogeri* or *S. louisianae* var. *obscuriventris*. The species is also recorded from Cuba and the Island of St. Thomas.

A dealated queen was taken from the soil beneath a rock in the Maricao Insular Forest at an altitude of 3,000 feet. Balock found a colony comprising about 30 individuals in a pod beneath cow dung in a dry pasture area at Juana Diaz. A winged queen was noted in this nest on January 31. The colonies of *S. eggersi* are very small, consisting of only a few dozen individuals. Absolutely nothing is known concerning the feeding habits of the ants. Kennedy, who made a study of the mouth parts of one species of *Strumigenys* in the United States, was led to infer that their food might be fungi.

The small worker (1.25-1.3 mm.) of this species is easily recognized by its elongate, slender, subparallel mandibles which have 6 to 7 minute denticles on their inner apical borders; and also by the very broad postpetiole, which is several times as broad as long.

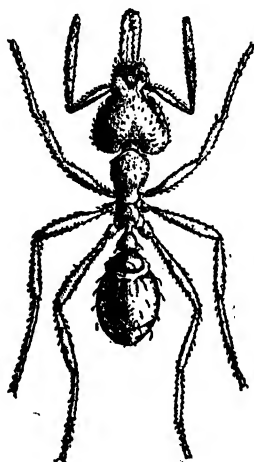


Fig. 12. *Strumigenys rogeri* Emery (After Wheeler.)

43. *Strumigenys rogeri* Emery.

Berl. Ent. Zeitschr., Vol. 7, pp. 253-254, 1862. *Worker*
Coamo Springs (W. M. W.); Arecibo, Mayagüez (M. R. S.)

This is apparently one of the most common species of *Strumigenys* in Puerto Rico and the other West Indian Islands.

Wheeler found this ant nesting in the soil under stones in a nearly dry stream bottom. I have collected the ants from colonies in a stump in a rather densely shaded coffee grove, from the soil at the base of a tree in a coffee grove, and from the soil beneath a stone near a small stream. What has been said about *S. eggersi* with regard to the size of colonies and possible food may also be applied to this species.

The worker of *rogeri*, which is 1.6 mm. in length, can be distinguished from the workers of other members of this genus by its cordate, deeply emarginate head; elongate mandibles, with two prominent subapical teeth on the inner border of each mandible before the apical teeth, and by the erect infra-spinal laminae on the epinotum of the thorax.

44. *Strumigenys membranifera* subsp. *simillima* Emery.

Bull. Soc. Entom. Ital., Vol. 22, p. 69, 1890. *Worker*

Lajas (H. L. D.)

A single specimen of this ant, a worker, was collected by Dozier from a clump of rather dry cow dung in a dry, arid pasture. The species has not been recorded from any of the other West Indian Islands except St. Thomas, from which it was originally described. Recently the species was recorded by me from Mississippi, this being the first time that it was noted in the United States. In Mississippi the species commonly nests in the soil beneath stones, wood, or debris. Colonies consist of only a few dozen individuals. Nothing is known about the food preferences of the ants.

The worker, which is 1.5 mm. in length, is characterized by the peculiar shape of its head which is distinctly rectangular anteriorly, by the coarse punctate sculpturing of the head, the small, triangular shaped mandibles, etc.

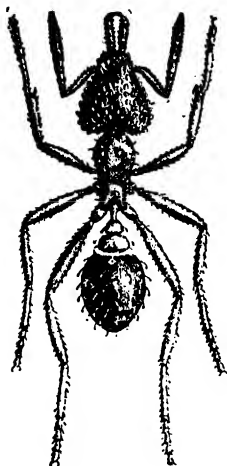


Fig. 13. *Strumigenys louisianae obscuriventris* Wheeler
(After Wheeler.)

45. *Strumigenys louisianae* var. *obscuriventris* Whlr.

Bull. Amer. Mus. Nat. Hist., Vol. 24, p. 145, 1908 *Worker*
Utuado, Coamo Springs (W. M. W.) ; Ensenada, Mayagüez
(M. R. S.)

Colonies of this ant have been found nesting in the soil beneath stones. At Ensenada the ants were collected from a dry pasture in one of the most arid sections of the island. Isolated workers have also been collected from rather densely shaded moist areas. Undoubtedly the species is highly adaptable to conditions of varying moisture and temperature. What has been said about the biology of the preceding species will also apply to this variety.

Wheeler, who described the variety *obscuriventris* from Puerto Rican specimens, states that it differs from the typical species "in having the gaster, except at the base, dark brown or black, and the ferruginous tint of the body in general darker." The worker is recognized by its elongate mandibles, the inner preapical border of which has a single tooth just before the apical teeth, and by the very distinctly squamiform hairs of the head, as well as by its size (2.25 mm.)

46. *Epitritus emmae* EmeryBull. Soc. Ent. Ital., Vol. 22, p. 33, 1890. *Worker*

Arecibo, Ensenada (M. R. S.)

Originally described from St. Thomas, this species has not been recorded from any of the other West Indian Islands except Puerto Rico and Cuba.

On one occasion two workers of this species were found nesting in the soil beneath a stone in an open pasture in one of the most arid areas of the Island. At Arecibo a single specimen, a worker, was found in the soil beneath a clump of Bermuda grass at the edge of a pineapple field. The colonies are undoubtedly very small, like those of *Strumigenys*. Nothing is known of the food habits of this species.

The worker is characterized by its 4-segmented antennae, the rectangular-shaped anterior section of its head, the squami-form hairs on the head, and its small size (1.25 mm.)

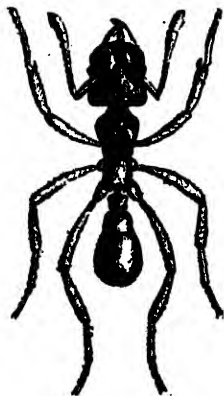


Fig. 14. *Myrmicocrypta brittoni* Wheeler. (After Wheeler.)

47. *Myrmicocrypta brittoni* Whlr.

Bull. Amer. Mus. Nat. Hist., Vol. 23, pp. 728-729, 1907.

Worker.

Santurce (W. M. W.)

This species of fungus ant was described from specimens taken in Puerto Rico and has not yet been recorded from any of

the other West Indian Islands. I have not been fortunate enough to collect the species, hence know nothing concerning the nesting habits and biology of the ant.

The worker of this species, which is monomorphic, has the frontal carinae very close to each other and dilated at the anterior extremity, the clypeus not distinctly prolonged between them; and the integument bristling with tubercules and spines, with hooked and scale like hairs.

48. *Cyphomyrmex rimosus* subsp. *minutus* Mayr.

Verh. Zool. Bot. Ges. Wien., Vol. 12, p. 691, 1862. *Worker* Culebra (W. M. W.); Arecibo, Adjuntas, Utuado, Monte Mandios, Monte Morales, Coamo Springs (W. M. W.); Hatillo, San German (H. L. D.); Rio Piedras, Cayey (G. N. W.); Ponce, Lajas, Mayaguez, Juana Díaz (M. R. S.)

This small fungus ant is not only a common species in Puerto Rico but it is abundantly distributed throughout many of the other West Indian Islands. I have found colonies of *minutus* nesting in rotten stumps and logs and in the soil beneath stones. Apparently the species is adapted to living in both arid and moist regions of the island. The colonies are very small, comprising only a few dozen individuals. Dozier on a number of occasions has collected the workers from cow dung. The worker of this ant, because of its small size and resemblance in color to the soil, is not always easy to see, and furthermore the ants have the habit of feigning death. Their food consists of yellowish, pear-shaped bodies of fungus. They may also eat flesh.



Fig. 15. *Mycocepurus smithi* Wheeler (After Wheeler.)

Madden found workers which he thought were feeding on nymphs of the mole cricket, *Scapteriscus vicinus*.

The monomorphic worker is distinguished by its prominent antennal foveae, scale-like hairs of the body, well-separated frontal carinae, etc.

49. *Mycocepurus smithi* var. *borinquenensis* Whlr.

Bull. Amer. Mus. Nat. Hist., Vol. 23, p. 718, 1907: *Worker* Vega Baja, Arecibo, Utuado, Monte Mandios, Coamo Springs (W. M. W.); Mayaguez, San Sebastian (M. R. S.)

This variety of fungus ant, which was described from Puerto Rican specimens, has not yet been recorded from any of the other West Indian Islands except Cuba. The colonies, which are very small, nest in the soil. The entrance hole to their nest is small and more or less obscured by the earth thrown over and around it. The workers superficially bear a resemblance in size, color, and opaqueness to those of certain species of *Pheidole* of the *flavens* group. The ants are not uncommon in the western end of the island and have especially been noted in red clay soil, but may occur in other types of earth.

The worker is characterized by having the frontal carinae close to each other and dilated anteriorly, the petiole with four teeth dorsally, the postpetiole with a deep impression dorsally, and the gaster bordered on each side by a carina.

50. *Trachymyrmex jamaicensis* André.

Rev. d'Entom., p. 149, 1893. *Worker*
Culebra (W. M. W.)

This fungus ant has also been recorded from Cuba and Haiti. I have not been fortunate enough to collect it in the main island. Mann, who studied the habits of this species in Haiti, states that the colonies are rather large. He found them nesting in the plain as well as in other localities which were more humid. In every case the nest was shaded. According to him the workers are diurnal but prefer the late afternoon for foraging. The food of these ants consists of a fungus which grows from a substratum made of leaves, buds, and other vegetable substances.

KEY TO THE SPECIES OF THE FAMILY DOLICHODERINAE.

(for the identification of workers)

- | | | |
|----|--|---|
| 1. | Scale of petiole either vestigial or absent ----- | 2 |
| | Scale of petiole more or less inclined, but well developed | 3 |
| 2. | Antennal scapes surpassing the posterior border of the head; head and thorax dark, gaster light----- | |
| | <i>Tapinoma melanocephalum</i> Fabr. | |
| | Antennal scapes not reaching the posterior border of the head ----- | |
| | <i>Tapinoma littorale</i> Whlr. | |
| 3. | Epinotum with a sharp and pointed conical elevation-- | |
| | <i>Dorymyrmex pyramicus</i> var. <i>niger</i> Perg. | |
| | Epinotum without a conical elevation, but with a gibbous protuberance dorsally ----- | |
| 4. | Head and thorax honey-yellow ----- | 4 |
| | <i>Iridomyrmex melleus</i> Whlr. | |
| | Head and thorax fuscous ----- | |
| | <i>Iridomyrmex melleus</i> var. <i>fuscescens</i> Whlr. | |

SUBFAMILY DOLICHODERINAE

51. *Tapinoma melanocephalum* Fabr.

Entom. System., Vol. 2, p. 353, 1793. *Worker*

Culebra (W. M. W.); Arecibo, Utuado, Ponce, Tallaboa (W. M. W.); Río Piedras (J. D. M.); Mayagüez, Guánica, Lajas, Tres Hermanos, Lares (M. R. S.)

This ant is not only common in Puerto Rico but is widely distributed throughout the Islands of the West Indies. It is quite versatile in its nesting habits, colonies occurring in the soil beneath stones, under the bark of trees, in hollow twigs, cavities, etc., of plants or trees, and also in rotten logs and stumps. Colonies are sometimes found nesting between the leaves of Tillandsias. Colonies appear to be moderately populous. There are many queens to a nest. The workers are highly predacious as well as lovers of honeydew. They have been noted attending the pineapple mealybug, the green scale, etc. The workers have given repeated trouble by invading insectaries and stealing the insects being reared therein. The ant is an inveterate house-attending form, sometimes even nesting in the house. The very small workers run along at a very rapid, erratic pace. When against a dark surface they give the appearance of a large mite. Workers have the peculiar "Tapinoma odor" characteristic of this group of ants. In Puerto Rico the

ant is commonly known as the "albaricoque", and in Cuba as the "hormiga boticaria", both names of which apply to the peculiar odor of this insect.

The worker is distinguished from that of the other species of *Tapinoma* here mentioned by its long antennal scapes, which exceed the posterior margin of the head, and by its distinctive color, the head and thorax being dark brown and the gaster whitish.

52. *Tapinoma littorale* Whlr.

Bull. Amer. Mus. Nat. Hist., Vol. 21, p. 109, 1905. *All castes.*

Monte Morales, Monte Mandios (W. M. W.); Doña Juana (H. L. D.); Maricao, Maricao Insular Forest, 14 kilometers east of Mayagüez (M. R. S.)

This species is apparently not so common as the preceding one, having been recorded to date only from the Bahamas, Cuba, and Santo Domingo. Wheeler's name *littorale* has not proved very distinctive for this species in Puerto Rico as neither he nor I have been able to find it elsewhere than away from the beaches, usually on mountains or hillsides. In every instance so far, the colonies of this ant have been collected from plants or trees where they have been nesting in hollow twigs or stems, in crevices between leaves, etc., indicating that the species is mainly if not altogether arboreal. In Puerto Rico the species has been taken most commonly at high altitudes of 3,000 feet or more. Little is known of the food habits of the ants, but it is inferred that they are probably given largely to attending honeydew-excreting insects. Dozier found workers attending a flat, black scale (*Lecanine*) on a palm at an altitude of 3,000 feet. When running over plants outdoors the species is very apt to be mistaken for *Brachymyrmex heeri*, which it closely resembles in size and color.

The small size of the worker (1.25-1.5mm.), its short antennal scapes (not attaining the posterior border of the head), and its generally pale yellow color, with occasionally an infuscation dorsally, serve to distinguish the worker of *littorale* from that of *melanocephalum*.

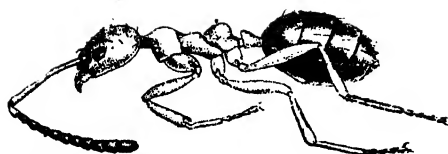


Fig. 16. *Iridomyrmex melleus*
Wheeler. (After Wheeler.)

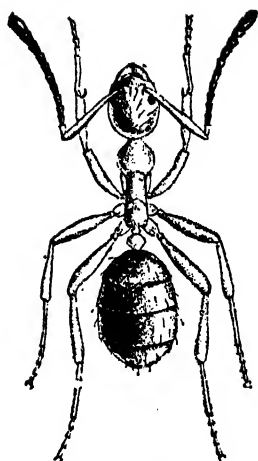


Fig. 17. *Iridomyrmex melleus*
Wheeler. (After Wheeler.)

53. *Iridomyrmex melleus* Whlr.

Bull. Amer. Mus. Nat. Hist., Vol. 24, pp. 151-153, 1908. *All Castes.*

Arecibo, Utuado, Monte Morales, Monte Mandios, Coamo Springs, Vega Baja (W. M. W.); Guayama (J. D. M.); Corazal, Aibonito (G. N. W.); Yauco, Las Marías, Mayagüez, San Germán, Maricao Insular Forest (M. R. S.)

This species, which was described from Puerto Rican specimens, has not yet been collected from any of the other West Indian Islands. This ant is extremely common and is apparently almost entirely confined to the mountains and hills; generally the species is found nesting in hollow twigs of trees or in crevices under the bark, between the leaves of *Tillandsias*, in rotten logs or stumps, in cocoons of the moth *Megalopyge krugii* Dewitz, and sometimes constructing a carton-like material over its nest on leaves. On one occasion, which was a very exceptional one, a colony was found nesting in the soil beneath a stone. The colonies are moderately populous. The workers are arboreal in habit and given to attending honeydew-excreting insects. They have been noted attending a mealybug, *Pseudococcus* sp., on *Tillandsias*, the green and hemispherical scales on coffee, and the plant louse *Toxoptera aurantiae*. When

alarmed the workers can run very rapidly. I have not been able to detect any odor about the workers as with some of the other species of *Iridomyrmex*. Winged males and queen pupae were noted in a nest on August 1.

The worker, which is from 2.0 to 2.25 mm. in length, is distinguished by its slender, graceful appearance; general honey-yellow colored body, with infuscated gaster. All of the antennae, except the scape and first segment, are infuscated.

54. *Iridomyrmex melleus* var. *fuscescens* Whlr.

Bull. Amer. Mus. Nat. Hist., Vol. 24, p. 153. 1908. *Worker* Monte Morales, Monte Mandios (W. M. W.); Maricao Insular Forest (M. R. S.)

In the Maricao Insular Forest I found this species very common at an altitude of approximately 3,000 foot where colonies were noted quite frequently back of where the axil of the leaf sheath attaches to the trunk of the Sierra Palm, *Euterpe globosa* Gaertn. Other colonies were found nesting under the same conditions as the species. Apparently the habits of the two forms are too similar to warrant further remarks.

The worker bears a striking superficial resemblance to that of the Argentine ant, *Iridomyrmex humilis* Mayr, in both size and color, and in its habit of running around very rapidly.

The worker of *fuscescens* is distinguished from that of *melleus* by its more fuscous body and appendages, with black gaster, yellowish mandibles, and whitish tarsi.

55. *Dorymyrmex pyramicus* var. *niger* Perg.

Proc. Cal. Acad. Sci., Vol. 5, p. 871, 1895. *Worker*

Santurce, Arecibo, Utuado, Adjuntas, Ponce, Aibohito, Coamo Springs, Vega Baja (W. M. W.); Boqueron (H. L. D.); San Germán, Tres Hermanos, Ensenada (M. R. S.)

This dark variety of the so-called "lion ant" has been recorded from the Bahamas, Cuba, Jamaica, Haiti, and Santo Domingo. Its nests are crater-shaped affairs constructed in rather open, sunny places. I have noted the ants in some of the driest areas of the island as well as in the more moist localities. Wheeler states that the ants nest in sandy areas, which

is true, but the species also nests in clay soils. Colonies are not very populous, usually containing only a few hundred individuals. Workers feed on both flesh and honeydew. Workers have the peculiar "Tapinoma odor" characteristic of this ant and some of the other Dolichoderine ants.

The worker can be distinguished from other closely related forms by its very distinctive cone-shaped epinotum, its long maxillary palpi, and very dark color.

KEY TO THE SPECIES OF THE SUBFAMILY FORMICINAE

(for the identification of the workers)

- | | |
|--|----|
| 1. Antennae with 9 segments ----- | 2 |
| Antennae with more than 9 segments ----- | 5 |
| 2. Last segments of the antennae forming a differentiated club; arboreal species ----- | 3 |
| Not as above ----- | 4 |
| 3. Length 1.75 to 2.3 mm.; second funicular segment broader than long--- <i>Myrmelachista ramulorum</i> Whlr. | |
| Length 2.3 to 2.6 mm.; larger and stouter; second funicular segment longer than broad----- | |
| <i>Myrmelachista ramulorum</i> var. <i>fortior</i> Whlr. | |
| 4. General body color yellowish, or yellowish brown---- | |
| <i>Brachymyrmex heeri</i> Forel | |
| General body color brownish black --- <i>Brachymyrmex heeri</i> var. <i>obscurior</i> Forel | |
| 5. Workers monomorphic ----- | 6 |
| Workers polymorphic ----- | 10 |
| 6. Antennal scapes very greatly surpassing the posterior border of the head, apparently twice the length of the head or more; body slender and graceful----- | |
| <i>Paratrechina longicornis</i> Latr. | |
| Characters not as above ----- | 7 |
| 7. Eyes extremely small, with apparently only 7 or 8 ommatidia; color pale yellowish brown----- | |
| <i>Prenolepis</i> (<i>Nylanderia</i>) <i>microps</i> , sp. nov. | |
| Eyes much larger, with many more ommatidia; color darker ----- | 8 |
| 8. Mesopleurae opaque, due to the dense pubescence covering it----- | |
| <i>Prenolepis</i> (<i>Nylanderia</i>) <i>fulva</i> Mayr. | |
| Mesopleurae smooth and shining----- | 9 |
| 9. Mesonotum with four macrochetae; all the body and appendages reddish brown, gaster darker ----- | |
| <i>Prenolepis</i> (<i>Nylanderia</i>) <i>steinheili</i> Forel | |
| Not as above <i>Prenolepis</i> (<i>Nylanderia</i>) <i>vividula</i> Mayr. | |

10. Head of major worker light red anteriorly; with pale spots often on first and third as well the second gastric segment; minor worker usually with spots only on the second segment. Head, thorax, and gaster of both major and minor workers dark brown, smooth and shining--*Camponotus sexguttatus* Fabr.

Color light yellowish brown, with the head and segments of the gaster often infuscated -----

Camponotus ustus Forel.

SUBFAMILY FORMICINAE

56. *Brachymyrmex heeri* Forel

Denkschr. Schweiz. Ges. Naturw., Vol. 26, p. 91, 1874.
Worker.

Culebra (W. M. W.); Santurce, Utuado (W. M. W.); Maricao Insular Forest, Mayagüez, Lajas, Las Marías, Juana Díaz (M. R. S.)

This minute species appears to live by preference in such habitats as coffee and citrus groves or well-shaded woods, although the ants are sometimes noted in open areas. The very small colonies, comprising only a very few hundred individuals, are found in the soil beneath objects or also even in rotting logs and stumps. The workers are exceedingly fond of honeydew and have commonly been observed attending the green and hemispherical scales, mealybugs on guaba believed to be *Pseudococcus virgatus* Ckll., the pineapple mealybug, and the aphids *Pentalonia nigronervosa* and *Aphis spiraecola* Patch. I have seen them attending the hemispherical scale along with workers of *Wasmannia auropunctata*. Winged queens were noted in a colony on February 14.

The worker is easily distinguished by its small size, its 9-segmented antennae, and its yellowish to yellowish-brown color.

57. *Brachymyrmex heeri* var. *obscurior* Forel

Trans. Ent. Soc. Lond., p. 345, 1895. *All castes.*

Santurce, San Juan (W. M. W.); Hatillo, San Germán (H. L. D.); Arecibo, Juana Díaz, Lajas, Ensenada, Mayagüez, Hormigueros, Tres Hermanos (M. R. S.)

This dark variety of *B. heeri* is not only a very common

ant in Puerto Rico but it is widely distributed throughout the West Indies. The ants form rather small colonies in the soil or in rotting logs and stumps, nesting by preference in more open areas than the preceding species. The ants if anything, apparently exceed *B. heeri* workers in their love for honeydew. They have been observed attending such economic insects as the green and hemispherical scales, and the aphids *Sipha flava* on sugar cane, *Pentalonia nigronervosa* on bananas and plantains, and *Aphis spiraecola* on citrus. As an attendant on the pineapple mealybug in Puerto Rico this ant is only excelled by the "hormiga brava". The workers must feed largely, if not almost exclusively, on honeydew. I have actually seen workers of this species with apparently uninjured and healthy pineapple mealybugs in their mouths.

The worker is recognized by its short, robust form, its 9-segmented antennae, and its very dark brown color.

58. *Prenolepis (Nylanderia) fulva* Mayr.

Verh. Zool. Bot. Ges. Wien., Vol. 12, p. 698, 1862. *Worker, Queen.*

Humacao (Van Z.); Isabella (L. C. F.); Arecibo (M. R. S.)

This species has been recorded from Cuba, Haiti, and Santo Domingo. Apparently the species prefers to nest in more open areas than in the woods or well-shaded spots. Workers are exceedingly fond of honeydew and have been noted attending the following important economic insects; *Pseudococcus sacchari* on sugar cane, *Aphis gossypii* on cotton, and the pineapple mealybug on pineapple. A worker was noted transporting a pineapple mealybug in its mouth at Arecibo. Other workers had greatly distended gasters, indicating that they had just fed on large quantities of honeydew. On the western end of the Island *P. fulva* does not appear to be as common or as widely distributed as some of the other species of *Prenolepis*. The ants are believed to nest principally in the soil in moderately small colonies. Workers when alarmed are able to run very fast.

The worker of this species is distinguished from those of other *Prenolepis* by its larger size, robust appearance, the deep brownish color and opaqueness of the body, as well as its very

long and large pilosity. There are more macrochetae on the mesonotum than with the species *steinheili* and *antillana*.

59. *Prenolepis* (*Nylanderia*) *vividula* Nyl.

Acta. Soc. Fennica, Vol. 2, p. 900, 1846. *All castes*.

Culebra (W. M. W.); Monte Mandios, Monte Morales ; Utuado (W. M. W.); Maricao (G. N. W.)

I have not taken any specimens of *Prenolepis* which I could definitely refer to this species. The variety *antillana* is very commonly distributed throughout the West Indies. One would expect to find the ants nesting in small colonies in the soil beneath objects and also in logs and stumps. Wolcott records the ants as nesting in the stem of a banana plant at Maricao.

Not having seen specimens which I am positive belong to this species, it is impossible for me to characterize it.

60. *Prenolepis* (*Nylanderia*) *steinheili* Forel

Trans. Ent. Soc. London, p. 324, 1893. *Worker*

Adjuntas, Santurce (W. M. W.); Lajas, Mayagüez, Maricao Insular Forest (M. R. S.)

Specimens of what I believe to be this species were collected from a colony in rich, mucky soil beneath a stone at the top of the Maricao Insular Forest at an altitude of 3,000 feet. The ants form small colonies in the soil or in rotting wood such as logs and stumps. Workers very probably feed on flesh as well as on honeydew. This appears to be one of the most common species of *Prenolepis* in Puerto Rico. It is also recorded from many of the other West Indian Islands.

The worker is characterized by having four large macrochetae on its mesonotum and the rest of the body is reddish-brown except the gaster, which is a little darker.

61. *Prenolepis* (*Nylanderia*) *microps* sp. nov.

14 kilometers east of Mayagüez (M. R. S.)

Worker: Length, 2 mm.

Head distinctly longer than broad, with very faintly emarginate border, and well-rounded sides and posterior angles.

Mandibles with 6 distinct teeth, of which the apical, the fourth, and the basal teeth are the largest. Antennal scapes very long, exceeding the posterior border of the head by at least one-third their length; first funicular segment small, not very much longer than broad; all the other segments of the antennae very noticeably longer than broad. Eyes extremely small for a *Prenolepis*, oval, with 7 to 8 ommatidia. Thorax strongly depressed in the region of the meso-epinotal region where there is a pair of prominent spiracles. Base of epinotum rounded and apparently only one-third to one-fourth the length of the declivity. Petiole rather thick on its superior border, inclined forward. Legs long and slender.

Extremely smooth and shining, with dark, erect hairs rather abundant over all parts of the body, but especially on the head and gaster. The mesonotum with 8 large macrochaetae. Color pale yellowish brown.

Described from 4 workers collected from the soil beneath a stone in a rather dense woods and not far from the edge of a stream. Cotypes in the collections of the United States National Museum and the writer.

The worker of this species differs from that of *Mann's myops*, to which it is closely related, by the following characters: (1) Difference in the number of mandibular teeth (*myops* has four), and (2) the sides of the head are distinctly convex and not straight.

These ants appear to be strictly subterranean, as is indicated by their pale color, and extremely small eyes. Nothing is known of the ant's biology.

62. *Prenolepis (Nylanderia) longicornis* Latr.

Hist. Nat. Fourmis, p. 113, 1802. *Worker*

Culebra (W. M. W.); San Juan, Santurce, Arecibo, Utuado, Adjuntas, Ponce, Tallaboa, Coamo Springs (W. M. W.); Yauco, Caguas, Mameys (T. H. J.); Lajas, Ensenada, Mayagüez, Guánica, Tres Hermanos, Lares, Sabana Grande (M. R. S.)

This introduced ant is not only one of the most common ants in Puerto Rico but it is also widely distributed through

the West Indies. From the towns into which it was first imported the ants have later been disseminated into the rural areas, until now the species is so abundant as to give one the impression that it is a native ant. This distribution is not yet uniform even though one often encounters the ants in wooded areas and coffee groves considerably removed from habitations. The workers of this species are known by the native name of "hormiga loco" or ("crazy ant") because of the habit the workers have of often speeding around very swiftly helter skelter without any definite sense of direction. I have encountered the species on the sandy beaches, in pastures in the driest areas of the island, as well as in moist and densely shaded areas. The workers are exceedingly fond of honeydew and have been observed on numerous occasions attending aphids, scales and mealybugs. They are known to attend the cotton aphid (*Aphis gossypii*), the green scale (*Coccus viridis*), the pineapple mealybug, (*Pseudococcus brevipes*), etc. This is one of the most important house-infesting ants in the island. Workers have been reported digging up lettuce seed and carrying tobacco seeds away from seed beds. Their fairly populous colonies may be found in the soil or in rotting wood.

The worker is easily recognized by its slender, graceful form, black color, and exceedingly long legs and antennae. The specific name, *longicornis*, well applies to the extremely long antennae of this species .

63. *Camponotus sexguttatus* Fabr.

Entom. Syst., Vol. 2, p. 354, 1793. *Worker*.

Culebra (W. M. W.); Fajardo, Morro at San Juan, Coamo Springs (W. M. W.); Loiza Aldea (H. K. P.); Mayagüez (J. S.); Coamo (G. N. W.); Naguabo (F. S.)

The genus *Camponotus* is very poorly represented in Puerto Rico. One of the largest and most beautiful species of this group in the island, however, is the species *C. sexguttatus*. It is apparently not so common on the western end of the island as *ustus*. Wheeler states that "it lives either in hollow twigs of trees and bushes, in bark, or in nests of coarse, loose carton, which it builds around the stems of grasses in savannahs by agglutinating the thread-like particles of grass and other

debris." The carton-like material is also used by the ants for plugging the open holes of twigs, or cavities in plants in the interior of which they nest. Plank found a colony nesting inside the dried fruits of the *Frescora* tree.

They were also collected by Sepulveda from the rotten roots of a mango tree in which they were nesting. Colonies are not thought to be very populous, probably consisting of only a few hundred individuals. Nothing is known of the ant's food habits. Owing to the variability of the spots in the color markings of these ants, they have been described many times under diverse names.

The characters mentioned in the key to the species will serve to distinguish *serguttatus* from any other species with which it might be confused.

64. *Camponotus ustus* Forel.

Bull. Soc. Vaud. Sci. Nat. (2), Vol. 16, p. 75, 1879. *All castes*. Culebra (W. M. W.); El Morro at San Juan, Utuado, Monte Morales (W. M. W.); San Sebastián, Ciales, Lares (G. N. W.); Mayagüez, Maricao Insular Forest, Ensenada (M. R. S.)

This species, which is rather common in Puerto Rico, has also been recorded from Haiti and the Virgin Islands.

Wheeler found the ants "nesting in the hollow twigs of the sea grape, *Coccoloba uvifera*." In Culebra he noted them nesting in the ground beneath a block of coral. Wolcott records *C. ustus* as being colonized in an old stump, and also in dead twigs of *Inga vera*.

On numerous occasions I have taken the species in the vicinity of Mayagüez, where they were found nesting in stumps, posts, dead branches of trees, etc., in colonies of only a few hundred individuals each. The smaller workers are very fast of foot and secretive. The soldiers can bite rather painfully when cornered.

At Ensenada a colony of the ants was found nesting in a dead branch of a tree in one of the driest and most arid areas of the island. When workers and soldiers were dropped on the

hot ground in full exposure to the sun they ran around frantically for several minutes and then expired. It is believed from this that the ants are crepuscular or night-working forms which do not forage during the daytime.

The amount of infuscation on the head as well as the general color of the body seems to be quite variable.

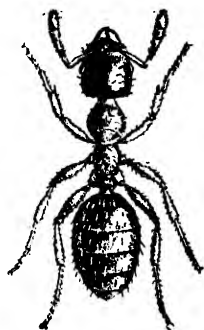


Fig. 18. *Myrmelachista ramulorum* Wheeler (After Wheeler.)



Fig. 19. *Myrmelachista ramulorum* Wheeler (After Wheeler.)

65. *Myrmelachista ramulorum* Whlr.

Bull. Amer. Mus. Nat. Hist., Vol 24, pp. 155-156, 1908.
All castes.

Culebra (W. M. W.); Arecibo, Utuado (W. M. W.); Lares, Yauco, Cayey, and Ciales Valley south of Manati (G. N. W.); Mayagüez, 15 kilometers northeast of Yauco, San Sebastian, Maricao (M. R. S.)

This ant, which is known by the local name of the "hormiguilla", was described by Wheeler from Puerto Rican specimens. Since that time the species has been taken in Santo Domingo and the Virgin Islands. Wolcott states that he has observed the species nesting at sea level, and Tulloch has collected specimens from El Yunque at an altitude of 4,000 feet. The distribution of the ant is closely affiliated with that of the plantings of coffee, since the typical Puerto Rican coffee (*Coffea arabica*) is also dependent on much shade and perhaps a high degree of moisture, like the hormiguilla. The hormiguilla

forms numerous colonies in the coffee shade trees, there being few trees that the ants do not nest in. Most of the individuals are to be found in the guama and guaba trees, one reason being that these are two of the most common kinds of shade trees in a coffee grove. On a moderate sized guaba tree I estimated there were 37,100 workers, 89 fertile or mother queens, and 60 winged males, or an average of 415 workers per queen. Since the ants nest inside of the twigs and galls of trees, one has little appreciation of the many, many thousands that may occur in a coffee grove. In one badly infested cuerda I estimated that there were over 5,000,000 ants. Inside of the galls and twigs of guama and guaba especially, and of a few other shade trees, the ants obtain much honeydew from the scale *Cryptostigma inquilina* Newstead, but this is also supplemented by honeydew obtained from such scales as *Coccus viridis* and *Saissetia hemispherica*, the plant louse *Toxoptera aurantiae*, and the mealybug *Pseudococcus nipae* and *P. citri*. In old, badly neglected coffee groves, especially where the guama and guaba trees are allowed to get very large, these ants migrate over into coffee and injure it by tunneling in the branches or trunk, by girdling the tree, or by causing large and unsightly galls. At picking time or during hurricanes the trees are badly injured through breakage resulting from the initial attack of these ants. Males have been seen at lights on numerous occasions, but no winged queens. It is believed that the males fertilize the queens on or in trees without these winged forms having to take the ordinary nuptial flight. Only on one occasion were winged queens and queen pupae encountered in a nest and this on December 13.

The worker is recognized by its 9-segmented antennae, its dark head and gaster with yellowish-red thorax, and its yellowish appendages.

66. *Myrmelachista ramulorum* subsp. *fortior* Whlr.

Bull. Bus. Comp. Zool. Harvard, Vol. 77, pp. 189-190, 1934.
Worker.

Mona Island (F. E. L.); Puerto Rico (W. M. W.)

This subspecies differs from specimens of the typical *ramulorum*, according to Wheeler, in the following respects,

"in being decidedly larger and more robust; the head larger and broader; joints two to five of the funiculi decidedly longer, the second distinctly longer than broad, the third and fourth as long as broad. Petiolar scale as in the typical form, with entire or very feebly and broadly sinuate superior border. In profile this border is decidedly thicker and blunter; the posterior pedunculate extension of the petiole well-developed as in the typical form. Erect hairs on the body, scapes and tibiae even more numerous and longer. Coloration more vivid, the mandibles and head being deep red, the latter blackish behind, the thorax and appendages of a more reddish-yellow tint than in the typical *ramulorum*." Nothing is mentioned by Wheeler concerning the biology of this form.

In my studies of the hormiguilla in the coffee groves I have noted on frequent occasions considerable difference in the size of workers in various colonies, those in incipient or weak colonies being strikingly small. This I attributed, however, to unfavorable conditions.

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NEW OR LITTLE-KNOWN SPECIES OF WEST INDIAN "TIPULIDAE" (DIPTERA) L. I.

BY CHARLES P. ALEXANDER

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A few interesting new species of crane-flies have been included in various lots of specimens sent to me for identification. The following sources are included: Puerto Rico, through Dr. William A. Hoffman; Cuba, through Professor Stephen C. Bruner and Mr. A. R. Otero; and the Bahamas, through Dr. John G. Myers. Through the friendly interest of the above-mentioned entomologists, I have been privileged to retain the types of the species in my private collection of these flies.

Shannonomyia hoffmani sp. n.

General coloration gray, the praescutum and scutum dark brown; pleura brownish black, sparsely pruinose; wings cream-yellow, sparsely variegated by dark brown areas; cell *R*3 small, vein *R*2+3 being longer than *R*2+3+4; cell 1st *M*2 elongate, closed; abdomen black.

Male.—Length about 5.3 - 5.5 mm.; wing 5 - 5.2 mm.

Rostrum and palpi dark brown. Antennae short; scape, pedicel and basal one or two flagellar segments light yellow, the remaining segments brownish black; verticils exceeding the segments in length. Head gray, the front and anterior vertex clearer and lighter gray.

Pronotum and lateral pretergites clear gray, the latter extending to the wing-root. Mesonotal praescutum and scutum almost uniformly dark brown, the median area of the former darker, the lateral portions more pruinose; scutellum uniformly blackened, sparsely pruinose; mediotergite gray pruinose. Pleura brownish black, sparsely pruinose. Halteres chiefly pale. Legs with the coxae brownish testaceous; trochanters obscure yellow; femora obscure brownish yellow, the tips weakly darkened; tibiae brown, the tips narrowly more darkened; tarsi black. Wings (Fig. 1) with the ground-color cream-yellow,

sparsely variegated by dark brown areas, including spots at arculus; a virtually common area at origin of *Rs*, *Sc*₂ and tip of *Sc*₁; series of spots along cord and outer end of cell 1st *M*₂; small marginal darkenings at tips of all longitudinal veins excepting *R*₅, the largest at 2nd *A*; veins yellow, darker in the infuscated areas. No macrotrichia on *Rs* or its anterior branch; *R*₅ with abundant trichia over its entire length. Venation: *Sc* short, *Sc*₁ ending about opposite one-third to one-fourth length of *Rs*, *Sc*₂ about mid-distance between *Rs* and the tip of *Sc*₁; *R*₂ about one-half shorter than *R*₂+3+4; *R*₂+3 longer than *R*₂+3+4; cell 1st *M*₂ elongate, closed; *m-cu* close to fork of *M*.

Abdomen black, the hypopygium a trifle paler.

Habitat.— Puerto Rico.

Holotype, male, Luquillo National Forest, at light, September 8, 1935 (W. A. Hoffman). Paratopotype, male.

Associated at light with *Shannonomyia leonardi* Alex. and *Erioptera* (*Mesocyphona*) *portoricensis* Alex.

I take great pleasure in naming this distinct crane-fly in honor of my long-time friend, Dr. William A. Hoffman. The only close ally in the West Indian fauna is *Shannonomyia leonardi*, likewise from the Luquillo National Forest. The latter is readily told by the uniform pale yellow coloration of the thorax, together with the brownish yellow abdomen. By my key to the Puerto Rican species of the genus (Journ. Dept. Agr. Puerto Rico, 26: 368; 1932), the species runs directly to *leonardi*.

Teucholabis (*Teucholabis*) *oteroi* sp. n.

General coloration yellow, variegated with black; lateral praescutal stripes bent laterad to margin; knobs of halteres infuscated; femora yellow, each with a single, narrow, pale brown ring immediately before midlength; tibiae uniformly yellow; wings whitish subhyaline, with three pale brown fasciae, the last being the narrow wing-tip; cell 1st *M*₂ closed; abdomen yellow, the basal/tergite black, the outer segments restrictedly variegated by brown/areas; the basal areas; male hypopygium with the margin of the basistyle produced into a thin, slightly blackened plate or flange; basistyle not produced at apex.

Male.— Length about 8.5 - 9 mm.; wing 7 - 7.5 mm.

Rostrum, brown, obscure yellow above, slightly shorter than the remainder of head; palpi black. Antennal flagellum black, the scape yellow; pedicel brownish yellow; flagellar segments oval, with conspicuous verticils. Front and anterior vertex blackened, the posterior vertex and occiput yellow, the latter with an inconspicuous darkened triangle.

Pronotum obscure yellow, darker anteriorly above. Mesonotal praescutum yellow, with three black stripes, the median one paling to brown on anterior end, its posterior portion ending abruptly some distance before the suture, leaving a conspicuous yellow area behind it; lateral stripes with anterior ends continued outward to margin of sclerite, isolating a yellow area between them and the suture; median area of scutum pale yellow, the lobes extensively darkened; scutellum weakly darkened; mediotergite obscure brownish yellow. Pleura chiefly darkened, heavily light gray pruinose. Halteres with the stem yellow, the knob infuscated. Legs with the coxae and trochanters obscure yellow; femora yellow, unmarked except for a single, narrow, pale brown ring just before midlength of the segment; tibiae and basitarsi yellow, the outer tarsal segments black. Wings (Fig. 1. 2) whitish subhyaline, with three pale brown fasciae, the first lying before level of origin of *Rs*, extending from vein *R* to the posterior margin; second band chiefly beyond level of cord, extending from the darker brown stigma to the posterior margin, including all of cell 1st *M*₂; third band including the narrow wing-tip; veins yellow, the costal field more brightly so; veins darkened where traversing brown areas. Venation: *Sc*₁ ending opposite midlength of *Rs*, the latter moderately arcuated; *R*₂+*3*+*4* a little shorter than the slightly oblique *R*₂; branches of *Rs* lying approximately parallel to one another to margin, cell *R*₂ being nearly three times as extensive at border as is cell *R*₄; cell 1st *M*₂ closed; *m-cu* shortly beyond fork of *M*.

First abdominal tergite black; outer segments yellow, very vaguely and restrictedly marked with darker, more extensively so on the sternites; hypopygium pale. Male hypopygium with the mesal edge of basistyle thin and weakly blackened, spine of basistyle long, slender, gently curved, the basal half pale and dilated; basistyle not or scarcely produced caudad at outer end. Outer dististyle a gently curved rod that terminates in a simple spinous point.

Habitat.— Cuba (Pinar del Rio).

Holotype, male, Las Animas, Sierra Rangel, altitude 1,500 feet, September 4, 1934 (S. C. Bruner and A. R. Otero). Paratopotype, male.

I take great pleasure in dedicating this interesting species to Mr. A. R. Otero, to whom I am indebted for several interesting species of Cuban Tipulidae. The species is very different from the remaining regional species of the genus in the diagnostic features listed. The nearest ally is the Jamaican *Teucholabis* (*Teucholabis*) *gowdeyi* Alexander, which differs conspicuously in the open cell *M*2 of the wings, the leg-pattern, and the structure of the male hypopygium.

Teucholabis (*Teucholabis*) *portoricana* sp. n.

Closely allied to *T.* (*T.*) *myersi* Alexander, of Cuba and southern Florida (Journ. N. Y. Ent. Soc., 34: 228 - 229; 1926), differing chiefly in the structure of the male hypopygium.

Male.— Length about 5 mm.; wing 5.5 mm.

Female.— Length about 5 mm.; wing 5 mm.

Male hypopygium with the apical spine of basistyle a straight pale rod, terminating in a short acute spine that lies in the same axis as the remainder of the rod. Outer dististyle pale throughout, slender, the spine on mesal margin small, suberect. Inner dististyle with the outer emargination shallow and much shorter than the basal one, the denticle separating them low and obtuse. Aedeagus with the apical point straight, pale throughout.

The male hypopygium of *myersi* has the apical spine of the basistyle large and conspicuous, the basal half dilated, the distal half abruptly narrowed into a long sinuous spine. Outer dististyle darkened throughout, the spine on mesal margin acute, subappressed. Outer dististyle elongate, the two emarginations subequal in size or the outer a trifle more extensive, the median denticle acute. Aedeagus with the apical point curved, blackened.

Habitat.— Puerto Rico.

Holotype, male, El Semille, Villalba, altitude 1,600 feet, at

light, January 26, 1935 (W. A. Hoffman). Allotype, female, Paratopotype, sex?

The wing-venation is shown in Figure 3.

Toxorhina (Toxorhina) distalis sp. n.

General coloration gray, the praescutum with three brown stripes; femora brownish yellow, the tips weakly darkened; tibiae brownish yellow, the tips narrowly brownish black; wings with macrotrichia of veins very sparse; *Rs* unusually long, exceeding in length vein *R*₅, due to the position of *r-m* close to outer end of the long cell 1st *M*₂; *m-cu* about two-thirds its length beyond the fork of *M*.

Female.— Length, excluding rostrum, 8 mm.; wing 5.5 mm.

Rostrum broken beyond the base, which is dark brown. Antennae with basal segments dark brown; outer flagellar segments broken. Head gray.

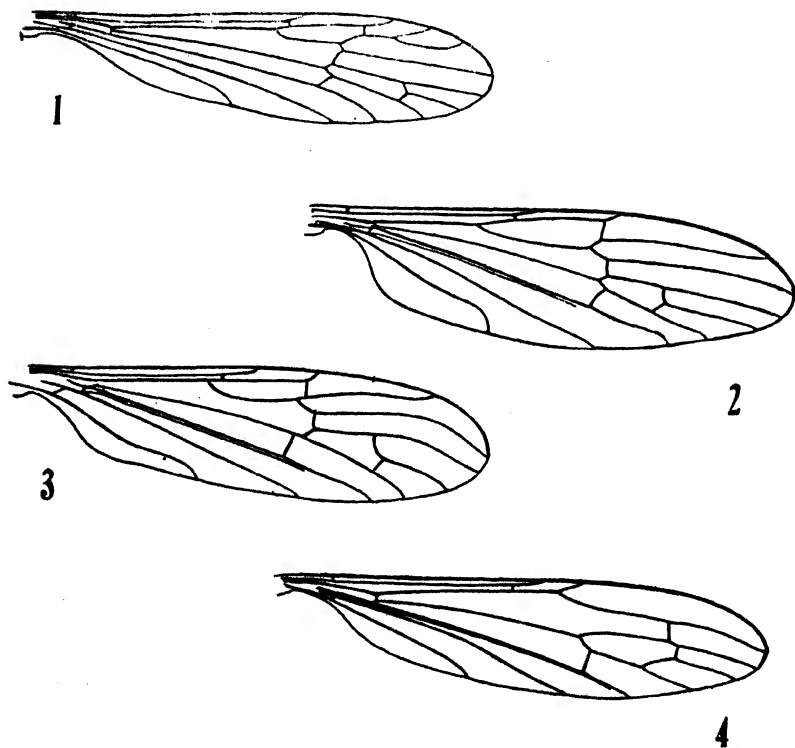
Cervical region dark brown. Mesonotum light gray, the praescutum with three brown stripes, the laterals somewhat less distinct; posterior interspaces weakly infuscated; centers of scutal lobes darkened; scutellum and mediotergite clear light gray. Pleura and extreme lateral margin of praescutum light gray, the ventral sternopleurite somewhat darkened. Halteres pale. Legs with the coxae weakly infuscated; trochanters yellowish testaceous; femora brownish yellow, the tips weakly darkened; tibiae obscure brownish black; tarsi brown. Wings (Fig. 4) with a grayish tinge, the pericardial region light yellow; veins brown. Macrotrichia of veins very sparse, in type with a single trichium near outer fourth of *Rs*; four or five scattered along *R*₅; an equal number near outer end of cell 1st *M*₂. Venation: *Rs* unusually long, exceeding *R*₅, due to the position of *r-m* far distad, close to outer end of cell 1st *M*₂; cell 1st *M*₂ present, elongate, exceeding cell 2nd *M*₂; *r-m* lying immediately before *m*; *m-cu* about two-thirds its length beyond the fork of *M*.

Abdominal tergites brown, the caudal and lateral borders, together with a more or less distinct crossband at midlength of the segments restrictedly darker.

Habitat.— Bahamas.

Holotype, female, New Providence, May 1932 (J. G. Myers) ;
Collector's No. 2557.

Toxorhina (*Toxorhina*) *distalis* is very different from all other regional species in the distal position of crossveins *r-m* and *m-cu*, together with the unusually long cell 1st *M*₂.



Explanation of figures.

- 1—*Shannonnomyia hoffmani* sp. n.; venation.
- 2—*Teucholabis* (*Teucholobis*) *oteroi* sp. n.; venation.
- 3—*Teucholabis* (*Teucholobis*) *portoricana* sp. n.; venation.
- 4—*Toxorhina* (*Toxorhina*) *distalis* sp. n.; venation.

THE LIFE HISTORY OF "DIAPREPES ABBREVIATUS" L., AT RIO PIEDRAS, PUERTO RICO.

BY GEORGE N. WOLCOTT,

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Less is known about the details of the life-histories of the Otiorhynchid weevils of the genera *Pachnaeus*, *Prepodes*, *Exophthalmodes* (or *Exophthalmus*) and *Diaprepes* than of any of the other common and comparatively large insects of the West Indies. This is all the more surprising because some of them are economic pests of primary rank, and at least in Puerto Rico and Barbados at the present time, they appear to be of relatively increasing importance.

The early work of the Rev. Watson on *Diaprepes abbreviatus* in Barbados in 1903 (15) and of Cook & Horne on *Pachnaeus litus* in Cuba in 1908 (3) is based on conclusions drawn from only a few individuals, and later workers have merely added field observations to form a tentative theory of what actually takes place during the subterranean period of development. With many insects, no serious error would be involved, but this group of weevils, and especially *Diaprepes abbreviatus*, displays such a wide variation in practically every aspect of its being that more exact information should be available. Attempts at rearing under close observation from egg to adult were first seriously attempted by the writer in Haiti in 1929, using *Prepodes quadrivittatus* (17), and later were resumed in Puerto Rico using *Diaprepes abbreviatus* (19). The development of a successful rearing technique (21) permitted the completion of a sufficient number of case histories to make possible this final report. Admittedly, the present paper treats of only one species at a single locality, but the determination of what factors are responsible for the wide variation shown by the individuals of this species in a single environment is still so uncertain that it seems desirable to present the data now available, which may serve as a basis for comparison with observations on this and other species in similar or quite different environments.

The diversity of the scientific names of the various members of this group of weevils should not obscure the fact that the insects themselves are fundamentally very similar, and indeed the points on which the genera are distinguished are so difficult to discover that to one species, *quadrivittatus* Olivier of Hispaniola, four generic names (all except *Pachnaeus*) have been applied in recent times by specialists in the nomenclature of Curculionidae. Not only do the systematists effectively fail to note essential differences, but the recent discovery that the egg-parasite, *Tetrastichus haitiensis* Gahan, attacks *Pachnaeus litus* in Cuba (2), *Prepodes quadrivittatus* in Haiti (from which it was originally described: 6), *Diaprepes abbreviatus* in Puerto Rico and *D. famelicus* in Montserrat (11) sufficiently indicates the fundamental similarity of these beetles as it appears to a specialized insect directly dependant on them for its existence. Moreover, from the standpoint of the farmer, the injury caused by these pests is practically the same everywhere that they occur in abundance, and is a single problem so far as the citrus or cane grower is concerned, regardless of what the entomologist calls the insect responsible.

Rarely are mature citrus trees in groves in Puerto Rico severely injured by the feeding of "vaquitas", as the adults of *Diaprepes abbreviatus* L. are locally called, altho several complaints have been received of injury to large trees. Nurseries and young trees just set out in the grove are much more often attacked, or at least the feeding of the beetles is more obvious to the grower on such small trees. The beetles feed almost exclusively on young tender foliage, altho when exceptionally abundant, they may attack the older leaves. Due to seasonal abundance of the weevils, most of the young foliage may be consumed at one time, while a later flush of growth escapes without commercial injury, but instances have been noted of trees being so repeatedly defoliated that they eventually died. Their death was presumably due to a combination of circumstances, for undoubtedly at the same time the grubs of *Diaprepes* were feeding on their roots. This only serves to emphasize, however, the dual nature of the injury caused by this insect in citrus groves: of the adults to the leaves, and of the grubs to the roots.

Vaquitas feed on the leaves of many other kinds of trees

besides citrus, and, especially in the case of those trees which obtain all their new leaves at the same time, such as the "moca", *Andira inermis*, often completely denude them of their leaves so that they remain defoliated for the remainder of the year. Or trees are sometimes noted that remain practically defoliated despite the constant production of new leaves. Young trees of "ceiba", *Ceiba pentandra*, have been observed with only a comparatively few vaquitas on them, yet even a few beetles (with their numbers constantly renewed as the older ones disappear) eating only the young leaves succeed in keeping the foliage permanently ragged.

Solitary vaquitas are found, especially in cane fields, but the adult weevils are essentially social in their habits. Dozens are often to be seen congregated on the young growth of small trees, and large trees being denuded of a flush of tender growth may harbor thousands at one time. For no ascertainable reason, particular trees are often preferred by the beetles to others of the same kind nearby, and even tho the beetles are free to move about and fly to others, they often remain congregated on such trees for weeks at a time. If disturbed by the presence of man, some individuals drop to the earth and crawl away between the vegetation, or, if on bare earth, clumsily run for cover. Others drop, but take flight before reaching the ground, while others clamber to a more protected situation on the host, or fly from it. In captivity, one continually hears the sound of their dropping to the bottom of the can, and presumably dropping to the ground is a common, natural habit, even when not disturbed.

The beetles apparently feed at all times of the night and day, but many are merely resting in the company of others, while numerous pairs are to be observed in coitu. In confinement, the elytra of the males often become densely covered with excrement, but in nature they remain clean and immaculate. Sometimes solitary vaquitas are attracted to lights at night, even as high as the second story of houses, and presumably they fly as readily at night as in the daytime.

The feeding of the beetles, for the most part, is due to the requirements of the female in the production of eggs, dropping off rapidly when she has ceased to oviposit, while that of the males is insignificant by comparison. The female during oviposition eats her own weight of food in a day. This is hardly

surprising considering that during her life-time she lays eggs sometimes weighing four or five times as much as she herself weighs. The eggs represent much more concentrated energy than do the tender leaves, which explains the tremendous demands of the female, depending on such innutrituous food, if she is to produce them.

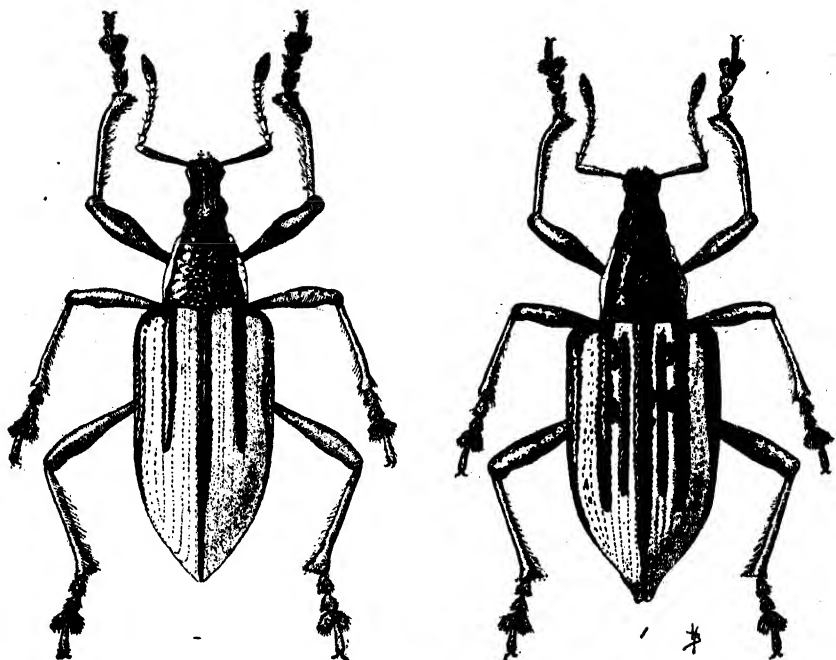


Fig. 1. Adults of *Diaprepes abbreviatus* L., five times natural size. (After Pierce.)

In captivity, adults live four or five months after they have transformed from the pupa, but often half of this time is spent below the surface of the ground. After the adult emerges from the ground, it never returns to burrow into it. Some adults live much longer than do others, the maximum number of days being 336, 295 and 262 for three females, and (rather doubtfully) 323 days for a male. The average is much less than this, however, for sixteen males being 123 days and for thirteen females 160 days.

The period of activity of the adults above ground is much less, averaging less than two months for all the males observed,

but over four months for the observed females, apparently indicating that the males spend considerably more than half of their shorter adult life below the surface of the ground, and the females very much less of their total time thus inactive. The females have a very definite objective in living: oviposition, which occupies all of their aerial adult life from less than a week after emergence from the soil until a slightly longer period after the final egg-cluster is laid. They are very tenacious of life (in captivity), and altho not at all active in old age, may yet survive for several days after becoming too weak to crawl about. Rarely do the males show any such gradual decay of their faculties, being apparently normally active one day, and dead the next.

In observing the females for oviposition, one male was always caged with a female, and in practically every case the female outlived not only one, but usually two males successively supplied to her as mates. In nature, the adults are often noted in coitu, and it seems probable that they are promiscuous in mating. Infertile eggs have never been noted, and presumably do not occur under normal conditions, individuals being sufficiently common so that no female should lack long for a mate. The number of adults reared of which the sex was determined was too small to accurately gauge the proportion of sexes, but indicates that the males are somewhat more numerous and possibly may be much more numerous. The apparent preponderance of males can not be due to a smaller amount of food available for the larvae, or, it is possible that, males being normally much more numerous, the intensive feeding of the grubs in captivity resulted in a somewhat abnormal number of females.

"Measurements of 82 males and 63 females taken at Rio Piedras on October 31, 1913, showed the average size of the females to be somewhat greater than the average size of the males. Some males were much larger than some females and some females smaller than some males, but no male was as large as the largest female and no females as small as the smallest male.

"The sexes can be distinguished externally by an examination of the last segment of the ventral surface of the abdomen. In the female the sides of this segment are straight and

converge to a distinct point at the tip, while in the male the sides are somewhat curved, curving in towards the rounded tip of the segment." (8)

Oviposition has not been observed. The original MS of Thos. H. Jones (3) contains the statement that "the eggs are deposited at night," altho this was crossed out by him before it was submitted for publication. So far as the writer's observations go, this statement is, without exception, entirely correct, at least for beetles in captivity. After fresh food and paper was supplied in the morning to pairs under observation, never has a single egg-cluster been found by late in the afternoon, while almost invariably one or two clusters of eggs were present the following morning.

Normally, the eggs are laid in clusters between leaves, or between the split tips of a single cane leaf stuck together with an adhesive. To make two shining tough leaves adhere to each other for seven days, until the eggs hatch, requires an exceptionally effective adhesive, and that used by the female *Diaprepes* appears to be entirely suitable to its purpose. Only one instance has been noted by the writer of its failure to function perfectly. This was in the case of an exceptionally large egg-cluster, laid between mango leaves during rainy weather, in which one leaf had come free, disclosing the eggs. The female rarely chooses tender leaves, on which the beetles might feed, but rather selects old and tough leaves, usually at some distance from the points where the other beetles are congregated. Sometimes two leaves naturally overlap, and in searching for clusters in the field, all such overlapping leaves should be examined. Egg-clusters have been found in the field between the tips of cane leaves and of Guinea grass (8), and between two leaves of jobo, mango, wild fig, caimito, eggplant and grapefruit, but presumably any two leaves, even of a plant not ordinarily used for food, may be used between which to place the eggs. Indeed, Dr. Herbert Osborn Jr., (20) found that the females prefer sheets of paper in captivity, and the writer that they select paper even in the field. In the experiments reported, the area of tough grapefruit leaves suitable for oviposition was several hundred, or thousand, times as great as that of paper exposed, yet two or three times as many clusters were found between the paper flags attached to the stakes to which the

nursery trees were tied, as between the leaves of the trees beneath, when examined at two or three day intervals.

Paper was invariably supplied to all the females in captivity on which observations on oviposition were being made, and the great bulk of the records are from egg-clusters laid between sheets of semi-transparent, oiled paper. Of course this does not simulate conditions in the field, but neither does confinement in a can, and limitation to companionship without a single male, but by providing a stimulus that at least counterbalanced the unfavorable factors of confinement, it certainly resulted in a large, if not the maximum egg-production.

Observations were made on the oviposition of twelve reared females in captivity. Three females, and as many reared males, kept in a can, and supplied with fresh citrus foliage and oiled paper on alternate days, were the first subjects of observation, but in later experiments, each female, with a male, was kept in a separate can. Reared males were used at first to keep with the females, but after three females had been (apparently) murdered by their mates, only males lacking the mandibular appendages, normally lost in burrowing upward thru the soil from the pupal chamber, were used.

Three to seven days elapsed after the females emerged from the ground before they began oviposition. Few general statements can be made regarding the details of oviposition. In some cases, the clusters laid at first, and those towards the end of the period did not contain as many eggs as those laid in the second, third and fourth weeks, while other females laid substantially as large egg-clusters at one time as at another. Some females often skipped a day or two, or more, without laying, while others were very regular in their habits. Some females which laid several large clusters each day, had finished oviposition in two months, or less time; others laid only one or two smaller clusters per day, or less, and continued oviposition for over six months. Most females laid their eggs only between the oiled paper supplied them, a few laid some of their eggs between the paper and leaf, a very few laid some eggs between leaves even when paper was present. A total of 745 egg-clusters was laid by the twelve females, presumably considerably less than the total if the three murdered females had lived to complete oviposition. Of these clusters, two-thirds contained between 30

and 88 eggs, one-eighth containing 30 to 39, and over one-eighth 40 to 49. Over five-eighths of the clusters contained more than 50 eggs, but less than one-eighth contained more than 100 eggs. Eleven clusters containing more than 200 eggs were laid in captivity, the greatest number counted in any cluster being 264.

The data on average weekly egg-laying are not as enlightening as they would be if three females had not been murdered so early in adult life, and if others with a small daily or weekly quota, by living so much longer almost equalled the total number of eggs laid by those laying many more eggs in less than



Fig. 2 Egg-clusters of *Diaprepes abbreviatus* L., between leaves of jobo. Twice natural size. (Drawn by F. Seín).

half the time. The twelve females averaged 469 eggs each during the second week of oviposition, and 622 eggs each during the third week. Ten females averaged 528 eggs each during the fourth week, and nine females 572 eggs during the fifth week. After this, the number of eggs laid appears to slump rapidly, but in reality, the females still ovipositing at this time are laying almost as many eggs as at any previous time, but those laying most eggs have ceased oviposition entirely. Most females lay fewer eggs in the last week previous to ceasing oviposition, but often lay most eggs, or largest clusters on the last day, or days.

One female laid 7,046 eggs between July 2nd and October 2nd, and six females laid nearly or considerably more than 5,000 eggs each during their periods of oviposition. Two others laid nearly or over 3,000 eggs, and three others were prevented from completing oviposition. (See Table No. 1.)

TABLE 1.
Oviposition by *Diaprepes abbreviatus* L.

Number of Female	U	P	First Egg-Cluster	Last Egg-Cluster	Days Oviposition	Total Eggs	Eggs per Day	Date of Death	Cause of Death
44.1	April	28	May 5	June 30	56	5,683	96	July 3	natural
44.7	April	28	May 8	July 9	62	5,683	96	July 14	natural
43.1	May	7	May 14	July 11	58	5,684	96	July 16	natural
40.2	May	11	May 16	June 26	41	2,961	71	June 28	natural
44.3	June	28	July 2	Oct. 2	92	7,046	75	Oct. 10	natural
45.11	Nov.	20	Nov. 23	Dec. 12	19	1,293	68	Dec. 13	murdered
47.5	Dec.	22	Dec. 29	Jan. 19	21	2,109	100	Jan. 21	murdered
47.4	Feb.	8	Feb. 15	Mch. 15	28	1,675	60	Mch. 15	murdered
47.00	Feb.	12	Feb. 15	June 7	112	4,982	44	June 7	natural
7.4	Mch.	12	Mch. 18	Oct. 7	203	5,219	26	Oct. 14	natural
7.6	June	7	June 12	Oct. 11	121	5,045	41	Oct. 26	natural
10.2	May	29	June 17	Oct. 25	130	3,335	24	Nov. 3	natural

Altho it is not safe to make statements as to anything being normal or average for *Diaprepes* in most of the details of its life-history, it seems obvious that 5,000 eggs may be considered as a reasonable expectation for most females of the species.

The average of several large egg-clusters indicates that the weight of the individual egg is .00017 gr. Multiplying this by 5,000 gives .85 gr. The minimum weight found for any reared female was .148 gr., the maximum .35 gr. Actually,

these weights mean but little, for when the digestive tract is filled with food and at the same time the ovaries with eggs, the total apparent weight of the female is much more than immediately after emergence from the ground, or at time of death. Even the net weight may vary considerably, as is shown by the weights of one female which on emergence from the ground on June 7th weighed .175 gr., on October 18th, a week after laying her last egg, .246 gr., five days later .222 gr., and .21 gr. on October 26th, on which date she had died. But even after taking into consideration all of these factors, it is obvious that the eggs laid by a female weigh at least twice as much as her own net weight, and may weigh three, four, or even five times as much as she does.

Normally, egg-clusters consist of only a single layer of eggs, altho sometimes towards the center of large clusters two partial layers may be found. Naturally, having the eggs laid in a single layer simplifies their being counted, and by supplying transparent oiled paper to the females, the counts can be made without disturbing the eggs. The shape of the clusters is usually more or less oval, but rarely are all of the eggs laid in a regular manner. The rows of eggs may at times go straight across, but more often each egg following the first is laid beside the other, but by about half of its length further down, making the rows transverse like those of bricks in ordinary construction. Several rows may be laid thus, and then the female apparently shifts to the other side, continuing by laying transverse rows of eggs in the opposite direction, crowding and doubling them sometimes, and rarely making a regular or even cluster. Some clusters are very elongate, often being only two or three eggs wide in the middle, but with more eggs at either end. On the transparent paper, the outline of the margin of the adhesive used can be plainly seen, extending completely around the outside of the cluster. From the way in which the eggs adhere when the enclosing leaves or papers are separated, it appears that all may have been laid on one leaf, to which the other leaf (or paper) is glued, or some may be on one leaf and some on the other. Trying to describe the typical or average egg-cluster is the more difficult because of the infinite variation displayed.

"The eggs are oblong-oval, smooth, glistening, with a rather tough membranous covering, about 1.2 mm. in length

and .4 mm. in diameter. Newly laid eggs are of a uniform milky white, but within a day or two after being laid, clear spaces appear at either end of the egg, this space being more pronounced at one end. Before hatching, the clear spaces disappear and the egg takes on a faint brownish tinge, the mouth-parts of the larva, contained within, being visible through the walls of the egg." (8)

Seven days after oviposition the eggs hatch. This incubation period is the most constant in an otherwise most variable life-history, and is apparently unaffected by any of the ordinary variations in temperature experienced in the tropics. The escape of the grubs from the confines of the egg-cluster's surrounding layer of adhesive may be delayed for some time, at least judging by the numbers of such grubs found and released when one is attempting to collect fresh or parasitized egg-clusters in the field. As previously reported (20), the adhesive is so effective when the cluster is laid between sheets of paper that the grubs do not escape its confines, and eventually perish. The grubs never attempt to pierce the papers or leaves, but eventually find a thin place in the adhesive, or by their wiggling loosen its hold on one of the leaves so that they can escape.

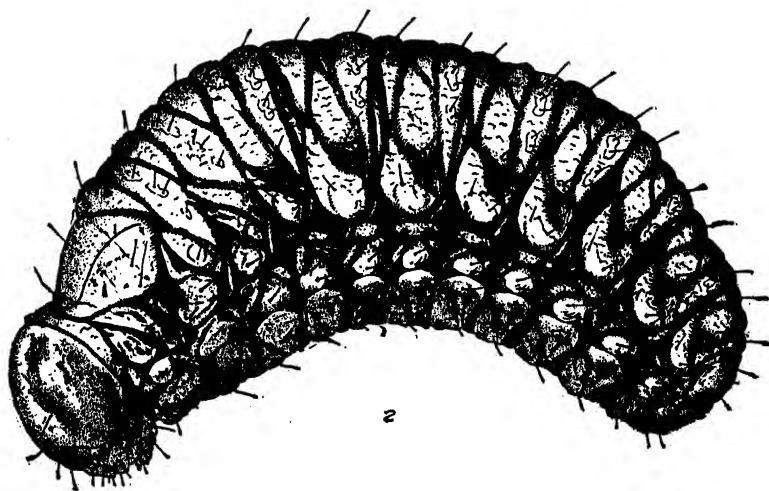


Fig. 3. Larva of *Diaprepes abbreviatus* L., five times natural size. (After Pierce.)

The escaped grubs move across the leaf with a peculiar galloping motion, and when they come to its margin, fall off. They do not burrow into the ground, and if (experimentally) it consists of finely sifted soil moderately well packed and without a crack, they continue to gallop about for several days, sometimes until their activities have sufficiently disturbed the surface of the soil so that they fall into cracks accidentally, and disappear beneath its surface. Even then, they show no inclination to stay beneath the surface, and a few will ordinarily be moving actively about at or just beneath its surface for a week or more after hatching. In nature, unsifted soil is so full of cracks that they promptly fall into one, and gradually work their way down into the soil so deeply that, barring accidents, they will not again appear at the surface until they become adult beetles. Some of the grubs happen to come in contact with minute rootlets, and eat and grow big enough to molt to second instar within a few days; others may wander about for a week or longer, apparently without eating, and some are still in the first instar while others of the same egg-cluster have grown to third instar size. Presumably some or most of these grubs which fail to come in contact with suitable food, or fail to learn to eat it within the first few days after hatching, also fail entirely and irrevocably, but others, even as long as two weeks after hatching, finally do eat and grow, and altho retarded at the beginning in their rapidity of growth, pupate at almost exactly the same time as do the most rapidly growing of their brothers and sisters, and develop into adults quite as vigorous. Apparently the margin of survival here is very broad, extensive enough to allow for several days at least after hatching before the grubs escape from the egg-cluster, and, if not needed there, equally useful before the grub must find food in the ground.

Presumably the grubs feed on any kind of living root of suitable size with which they come in contact in the ground. Definite records are available of their being collected in the field attacking only the roots of sugar-cane, grapefruit, pepper, lima bean and yuca. Lima beans were used as food for some of the grubs in the laboratory, but the bulk of them were reared on corn. The attack of the larger grubs on the root-stalks of sugar-cane, into which they burrow, has long been known, and has been considered the principal injury to economic crops caused

by this pest. The small grubs do not hesitate feeding on roots too small for them to burrow inside of, and indeed the habit of



Fig. 4. Larva of *Diaprepes abbreviatus* L., feeding in root-stalk of sugar-cane. One-half natural size. (Drawn by F. Seín).

burrowing inside of their food supply seems not to be well developed until they are partly grown. The smallest grubs have not been noted burrowing into kernels of corn, but only feeding on corn rootlets from the outside, but third and fourth instar grubs often burrow inside dry and unsprouted kernels of corn, growing much more rapidly than others on the outside feeding on the roots or rootlets.

The grubs of *Diaprepes* are apparently so well able to withstand long periods of fasting at any time in their growth that only the outmost care in continually providing fresh and attractive food in abundance is the experimenter able to induce them to feed to capacity and make most rapid gains in weight until full size is attained. By comparison with the industrious manner in which caterpillars feed, the grubs of *Diaprepes* are

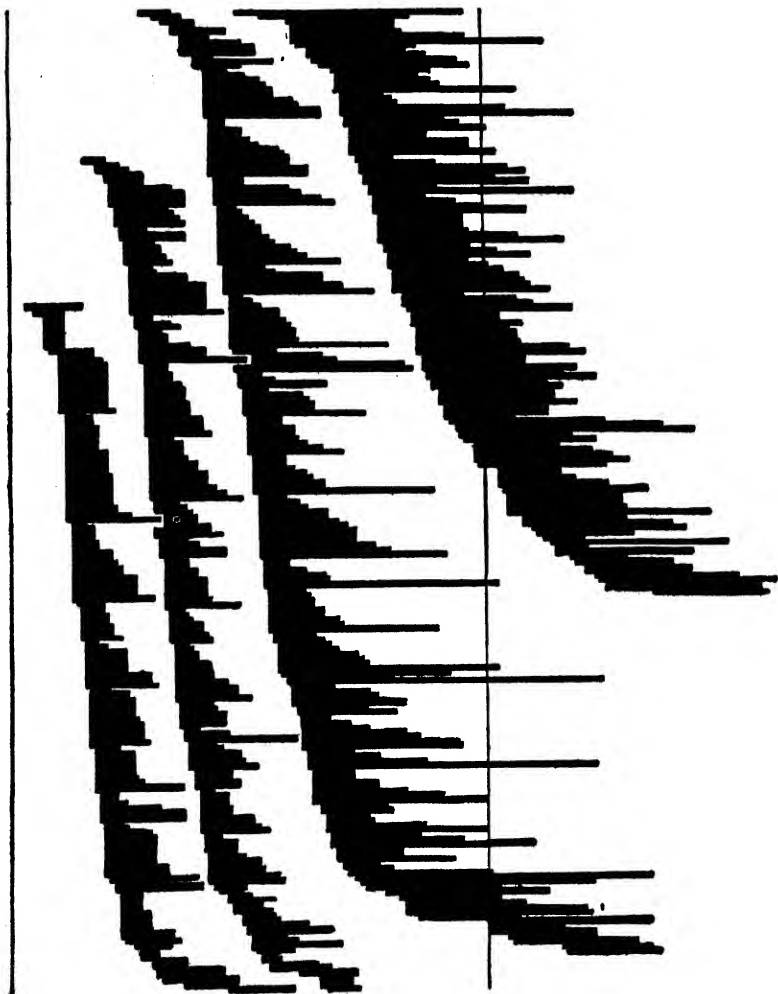
most dilatory, and only when they are completely surrounded by food do they display their maximum capacity for rapid growth. As shown by the number of days for them to reach sixth instar, the rapidity of their growth is as follows: for those hatched in March 79 days, for those hatched in May 80 days, in June 55 days, in July 55 days, in August 57 days, in September 42 days, in October 54 days, in November 51 days, in December 46 days and in January 50 days. If dependence may be placed on these data, obtained from eighteen eggs clusters in ten months, slowest growth from grubs hatching in the spring is indicated, and most rapid growth of grubs hatching early in the fall. The extremes are represented by one grub hatching in September which attained sixth instar in 27 days from hatching, and another hatching in March which required 126 days to attain the same size, extremes, however, which are typical of all grubs hatching in the autumn versus those hatching in the spring.

By comparison with the variations in some other periods of the insect's development, that in growth seems insignificant, but if it means anything at all, it may be part of the tendency of the individuals concerned to return to a year life-cycle, with the eggs normally laid in the summer. So far as can be determined, it is not a reaction to temperature, as the seasonal variation of the temperature means averaged only 10°F. at Rio Piedras (12°F. between minimums, 8°F. between maximums, recorded in the Insectary beside the rearing cans and tubes), or only half the difference between the average day and night extremes of the twenty-two months of which the records were kept. Thus, while grubs grew most rapidly in September, and most slowly in March and May, those from eggs hatching in June, July and August paralleled in rapidity of growth those hatching in October, November, December and January. It should be especially noted, also, that the seasonal variation in rapidity of growth is by no means as great as the individual variation shown by grubs from the same egg-cluster.

As previously noted (21), the minimum time in which a grub has been reared to full size (eighth instar) is 48 days, and another grub from the same egg-cluster, 53 days, but two other grubs from the same egg-cluster, which required over twice as long to attain the same size, pupated and shortly afterward transformed to adult at practically the same time. Molting to

Variation in Rapidity of Growth of Larvae of *Diaprepes abbreviatus* L., as shown by 140 individual records in 2nd Instar (left), 170 individual records in 4th Instar, 193 individual records in 6th Instar and 130 individual records (for growth period only) in 8th Instar (right).

Each horizontal series of squares in an instar group represents one individual record (those in the same line in different instar groups are rarely and only accidentally of the same individual); the number of squares indicates days, the distance between the two vertical lines represents 100 days, the one on the left being date of hatching of the larva from the egg.



eighth instar has been taken to mark the time of maximum weight, but unfortunately for consistency in making the records, many grubs do not molt that many times as larvae, but pupate from the sixth instar. Thus, to make all data comparable, the records have been grouped on the basis of the rapidity with which the grubs reached sixth instar. They indicate tremendous variation in rapidity of growth in the various larval instars, a variation which is even more obvious in the accompanying graph. (See graph.)

The grubs of *Diaprepes* may have as few as six larval molts before pupation, but normally have eight, and may have many more. Before the experimenter realized the necessity of the grubs for a diapause period during or after growth, and while he was continuing to supply them with an abundance of food, which they half-heartedly attempted to consume, some of them molted as many as a sixteen times, one successfully pupated after molting fifteen times, another after thirteen molts, one after twelve, two after eleven, and many after molting ten or nine times as larvae. Ordinarily, larval molts exceeding the usual number are a reaction to unfavorable conditions such as cold, or lack of food, but in the case of *Diaprepes*, the unfavorable condition appears to have been a surplus of food.

A diapause period in the life-history of *Diaprepes* is not only normal, but apparently essential before the fully-grown grub can pupate. At the beginning of this period, the grub is very active, and presumably in nature may travel to considerable distances in the ground. It eats, more or less, but continually less, and becomes less active as the period of pause lengthens. Normally, it does not molt, and the period from the last larval molt until pupation may be considered the extent of this period of waiting.

The diapause period may be for less than two months, or it may be for nearly thirteen months. Its extent is not appreciably affected by previous rapidity of growth, the time of the last larval molt, humidity of the soil, temperature or time of year. So far as the writer can determine from the data available, it is entirely unpredictable. For instance: of two grubs hatched in September, one, molting to ninth instar after 144 days, waited 315 days before pupating, the other, molting to eleventh instar after 115 days, pupated in 55 days. These grubs

TABLE No. 2

Duration in Days of Diapause Periods of Larvae of *Diaprepes abbreviatus* L. grouped according to the Month in which the Larva Hatched.

November	December	January	March	July	September
					55
					65
					68
					75
					76
					89
			91		90
					90
					94
					95
			106		102
				123	
				124	
			129	124	
				131	
				132	
				133	
			134	133	
				138	
	137		140	142	
				145	
		153		152	155
				157	156
					169
	171	172	172		
			175		
	187	185			
			197		193
			199		
202	200		200		
	223	223	220		226
					231
246		241	244		
		236			233
		250			
		250			250
255			261		
265		266	264		263
		277	271		
283		282			
			291		
		297			
		299			
		299			
318					315
		341	347		
			388		

were side by side in identical glass tubes, receiving the same amount of moisture from the moistened sand below. The diapause periods of others from the same egg-clusters, which had grown very rapidly were: 65, 68, 76, 89, 90, 102, 155, 156, 169, 226, 233 and 267 days after the last larval molt. Other grubs from the same lots, which grew more slowly had diapause periods of 91, 106, 129, 134, 135, 140, 172, 175, 197, 199, 200, 244, 261, 264, 271, 291, 347 and 388 days. There appears to be no consistency here. Out of twenty-six grubs hatching in November, December and January, twenty-two had diapause periods of eight months and longer, the two longest being 318 and 341 days. The only group of grubs showing any consistency are those hatching in July, all twelve of which had diapause periods of four to five months. That is, of this group only, one might with reasonable confidence predict the extent of the diapause period. (See Table No. 2)

If one is to suppose that the grubs hatching in July (or a little earlier or a little later) from eggs laid in June, represent the normal, original life-cycle, that they should all attain full size at about the same time and all be ready to pupate at about the same time seems only reasonable. As has been previously pointed out however (21), the egg parasite, *Tetrastichus haitiensis* Gahan, is most abundant in June, consequently few grubs survive from eggs laid at this time. Survival, for *Diaprepes abbreviatus* wherever this parasite is present, depends largely on being different, on deviating from the normal, and thus bringing the period of oviposition at a time of year when the egg parasite is scarce. The period of incubation of the eggs is very definitely fixed at seven days, that of growth varies only from two to four months, and that of the pupa from fourteen to twenty-six days, and that of the aerial adult female is but little more than the time necessary to lay her eggs. The two periods least definitely fixed, or susceptible to the greatest variation, are as adult in the soil or as a larva in the diapause period. The maximum recorded diapause period, 388 days, is seven times that of the minimum, 55 days.

Early in the diapause period the grub wanders about in the soil with tremendous energy, in captivity churning up the small amount of soil available in its restricted quarters and breaking off the roots of any plant growing within the container.

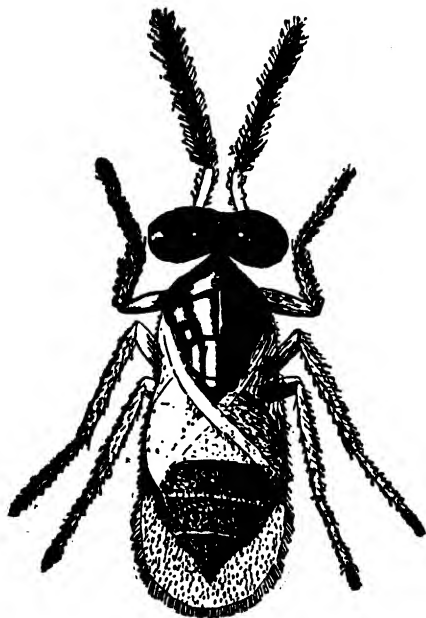


Fig. 5. *Tetrastichus haitiensis* Gahan, sixty times natural size. (Drawn by G. N. Wolcott.)

In nature, its wanderings are directed towards no fixed goal, and it may eventually come to rest close to where it started, yet many grubs, by accident, doubtless wander far afield. The survival value of this display of energy is not obvious, and seems to lead nowhere. It may be an attempt to escape from externally parasitic mites. These mites, determined by Dr. H. E. Ewing, of the U. S. National Museum, as *Rhizoglyphus phylloxerae* Riley, first appear on the head and body of the grub when it is about half grown, continuing to be present in increasing numbers on some individuals until pupation. At each molt the grub escapes from the mites if it moves away soon afterwards from the molted skin to which the mites still remain attached, but this easy escape from their tormenters is no longer available during the diapause period, when it does not normally molt. The mites can be dislodged artificially by rubbing, and possibly some of them are rubbed off by the grub in rapidly making its way thru the soil. The grub appears to show no deleterious ef-

fect from a light infestation of mites, but when they completely cover the head and fore part of the body, one may be reasonably sure that that particular grub will not survive to become adult. Of course such heavy infestations are presumably due to the artificial conditions and close quarters under which the grubs are reared, and would occur but rarely, if at all, in nature.

The wandering of the grub during the diapause period may also tend to lessen the mortality caused by the Green Muscardine fungus, *Metarrhizium anisopliae* Sorokin, by shifting the position of the grub in the soil to localities where the humidity is less favorable to infection by and growth of the fungus. Numerous grubs, many pupae and a few adult beetles (while still in the soil) died as a result of infection by the Green Muscardine. In most cases, the insect was accidentally injured, mite-infested, or sub-normal before infection by the fungus took place, and no instance can be recalled of any insect supposed to be entirely normal and healthy succumbing to infection by the Green Muscardine. Indeed, many mite-infested and subnormal individuals seemed to have surprising high resistance to fungus infection, and often lived for days, weeks, or even months before finally succumbing to attack. Thus, the conclusion of the experimenter is that this fungus is not strongly pathogenic, but merely is the first to develop in insects about to die primarily from some other cause. The many deaths of grubs recorded as being due to this fungus or to mass infestations of mites are in reality due to the somewhat abnormal conditions under which the grubs were reared, and dropped considerably towards the end of the investigation when rearing methods had been more nearly perfected. Under normal conditions in the field, it is believed that neither the mites nor the Green Muscardine are of importance in causing larval mortality of *Diaprepes*.

Indeed, the extraordinary energy displayed by the grub in wandering about at the beginning of the diapause period seems almost inexplicable, as it does not terminate in the selection of a different and more desirable location for the pupal chamber, as at the very end, the more or less quiescent grub again changes its position. Thruout the diapause period the grub rests or travels horizontally or transversely in the soil. When ready to pupate, however, it forms a vertical chamber in the soil, and rests in it with the head up. It is a very active, and

spins round and round on its caudal end in the pupal chamber, compacting the soil of the walls. Pupation occurs within two or three weeks after the chamber is formed.

Pupae are formed in every month of the year, but of the records available, nearly one-third are in the month of March. Almost a sixth are in the month of October, with no definite trends for the other months. Obviously, March is the normal, original month, the others quite as obviously being wide variations from this norm. Fifty records are available as to the duration of the pupal period, but due to the difficulties of observation in many cases, too much exactitude can not be claimed for all of them. Nine days is the recorded minimum (which seems doubtful), but almost a third are of 14, 15 and 16 days, and slightly more than two weeks seems normal. The bulk of the records are from 17 to 26 days, the few of greater length being of doubtful verity.

When first formed the pupa is entirely waxy white, but a few days before the adult is to emerge, the eyes of the pupa begin to darken, the claws are seen to be black, and the underwings are clouded with grey. The color deepens rapidly, and within a few days the adult will have crawled out of the pupal skin. Within a day it is fully colored, at least in the chambers which were open on one side for observation. Whether the color transformation is as rapid as this in complete darkness was not determined. The adult remains quietly in its pupal chamber long after it is apparently hard and physically able to emerge. To determine what factors might be responsible for the emergence of the adults from the ground, complete daily records of maximum and minimum air temperatures were kept, and some tubes watered profusely from the top, while others received only the moisture coming up from the wet sand below. While one or two adults might appear to have been affected by sudden temperature changes, or hurricane weather, or excessive moisture, so many others were unaffected that the only conclusion reached from the experimental evidence was that the adults emerged entirely without reference to external factors.

Eleven days is the minimum recorded time for the adult vaquita to remain in the pupal chamber before coming to the surface of the ground and 126 days the maximum, or twelve times as long. The length of the period appears to be entirely fortuitous: of the forty-six records, somewhat over a third are

between 33 and 48 days, and nearly half are for over two months. The records of individuals which hatched from eggs in July show not quite as much variation as do all the others, the extremes being 20 and 92 days, and over half being between 33 and 48 days. Possibly in nature, continued heavy spring rains would be more effective in bringing most of them to the surface at one time than the temporary drenchings experimentally attempted in the tubes, indicating that five or six weeks may be normal extent of this period. The suddenness with which numerous adults appear in Barbados after the spring rains have commenced, following a comparatively dry winter, has suggested the probability that the rains are the stimulus causing pupation (13). It seems much more likely that the rains are the stimulus for the emergence of the adults, as pupation presumably took place several months previously. Since no egg parasite of *Diaprepes* occurs in Barbados, the insect is not faced with the necessity of varying from its normal life-history if it is to survive, and consequently most of the adults appear at one time in the spring.

During most of the period when the adult is in its pupal cell, it appears ready to emerge at any time, being completely hardened, and, if disturbed by having its cell broken into, will crawl out immediately and act as tho it had emerged normally. If replaced in its cell, and the top layer pressed into place, it may remain there for the time being, but in every case was at the surface of soil by the next morning. In the summaries of life-histories, no distinction is made as to whether the time of emergence was normal or artificially induced, and is indicated as "up".

The Otorhynchid, or "scarred-snout" beetles, to which group *Diaprepes* and allied species belong, are characterized by scars at the end of the beak marking the disappearance of the so-called "mandibular appendages," which, in the case of *Diaprepes*, are prominent, curved, black claws, even larger than the jaws with which the insect eats. The presumed purpose of these mandibular appendages is to enable the insect to make in June of the second year following, and two others (which buried pupal chamber, and they are supposedly just strong enough for this, yet so insecurely attached to the beak that they will fall off soon afterwards (being no longer needed by

the insect), leaving scars on the beak where they were attached. The pupal chamber of *Diaprepes* normally occurs at a considerable depth in the ground, at a much greater depth than could be obtained in the glass tubes used in the rearing experiments. Consequently, in digging their way out thru the comparatively small amount of earth over their pupal chambers, several of the beetles failed to dislodge these mandibular appendages, one or both of which remained attached as long as the individuals lived. They appeared to be very much in the way of the insect when feeding, the punctures made by the appendages being very noticeable beside the margins of the leaves where these beetles had been eating. Most of the individuals failing to loose these claws were males, the results of this abnormality in three cases resulting in the untimely death of their mates. One can not be sure that the presence of these claws on the jaws of the male was responsible for the death of the female, yet no more females died when supplied only with males lacking these formidable appendages, and the evidence seems reasonably conclusive. In nature, such occurrences would be rare, if they occurred at all, and in the present instance were due to the interference of man.

The total life-cycle of *Diaprepes* may be considerably less than one year, or it may be over two years. It must be admitted that no individual records of the latter maximum have been obtained, but that they actually occur seems quite certain. The minimum period is of larvae which hatched from the egg in September, and of which adults emerged from the ground by the following April. Within less than a week after the female adult has emerged from the ground she begins to lay eggs, and by a week later these eggs have hatched. This is not an exceptional or unusually short life-cycle for the insect, as all of the reared individuals hatching in July, and the bulk of those hatching in September completed their development in a month less than a year.

By contrast, all of the grubs hatching during the winter months required at least a year for their development, most of them several months longer, and of those hatching in January, records are available of one female emerging from the ground in June of the second year following, and two others (which escaped without their sex being determined) in July of the second year. Altho some females have finished laying all of

their eggs within two months, others require more than twice as long, and one is recorded as requiring nearly seven months after emergence from the ground before she had laid her last egg. From egg to egg in this (theoretical) instance over two years elapse.

Presumably the normal, original life-cycle approximated one year, with the adults appearing above ground in the late spring and early summer. Most of the females appearing at this time of year lay all of their 5,000 or more eggs in less than two months; thus, altho some scattering might occur, most of the individuals would maintain the one year life-cycle. Judging by the records available, the grubs from the earliest egg-clusters (May) would be slowest in developing to adults (May to August), and those from the latest (September) most rapid (April and May).

Opposed to this tendency of some individuals to return to the normal one year life-cycle, is that of others, farthest removed from the normal time of egg-laying, to develop a much longer cycle shown in the records by one September-hatched grub emerging as adult in the second November following, November and December-hatched grubs emerging in the second April following, and January and March-hatched grubs with emergences of adults scattered from the following December to June and July of the second year. (See Table No. 3.)

The total number of rearing records on which this paper is based is close to two hundred forty, and even of the life-cycles completed to the natural death of the adult is so large as to preclude publication in full. Yet it seems desirable to present some presumably typical case histories. In all of these, the number of days given is from date of hatching of the egg. The numbering of the individual is a decimal, that of the egg-cluster from which it hatched is the whole number preceeding the decimal point. Ordinarily, the most rapidly growing grubs were separated from the others from an egg-cluster when in third instar, and given a number at this time; thus .1, .2, .3, .4, etc. are presumably the most vigorous grubs, while .11, .12, .13, etc. are less rapidly growing grubs, separated from the others at a later date, and .00, and .0 are the runts, those left in the original can after all the other larger ones had been removed and placed in separate cans.

TABLE No. 3.

Month of Emergence from Pupal Cell of Adult of *Diaprepes abbreviatus* L., arranged according to the Month in which the Larva Hatched.

Month larva Hatched	Adult emerged from Pupal Cell in month of:											
	Nov.	Dec.	Jan.	Feb.	Mch.	Apr.	May	June	July	Aug.	Sept.	Oct.
November	?	♀	♂	♀♀		??						
December		♀				♂						
January		♂	♂?		?	♂	?	♀	??			
March		?	♂		♂♂	♂	♂	♀				
May					?		♀			♂		
July						???	♀♀	??				
September						♂♂	???	♀	♂♂♂	♂	♂	♀

Diaprepes abbreviatus L. individual No. 44.1 hatched from the egg September 7, 1933, molting to successive larval instars up to and including the tenth in 7, 11, 15, 20, 27, 34, 48, 95 and 117 days, having a diapause period of 76 days before pupating on the 193d day (March 19th, 1934), transforming to a female adult on March 28th, and coming to the surface of the ground on April 30th. She was one of three females whose combined egg production was 17,050 eggs, and she died on July 3, 1934, 299 days after hatching of the larva from the egg.

Individual No. 44.3 molted to the tenth larval instar on the 119th day, and was noted as a soft adult on March 27th, but did not come to the surface of the ground until June 26th. She laid 7,046 eggs, and was very tenacious of life, appearing dead on October 3rd, but was not actually devoid of life until Oct.

10, 1934, at which time she weighed .345 gr. From date of hatching, she had lived 398 days.

Individual No. 44.8 molted to the tenth larval instar on the 105th day, but had a diapause period of 263 days before pupation. The male adult was first noted on September 25th, over a year after the date of the hatching of the larva, came to the surface of the ground on October 23d, and was dead by November 26th, weighing .144 gr. at time of death.

Individual No. 44.24 molted to the ninth larval instar on the 100th day, and pupated 94 days later. The adult male emerged from the pupal cell on July 18th, having been there as a fully-formed adult since April 4th. He died on August 11th, 27 days less than a year after the grub had hatched.

Individual No. 45.3 hatched from the egg on September 11, 1933, molting to successive larval instars up to and including the eleventh in 10, 22, 26, 30, 36, 49, 60, 81, 94 and 115 days respectively, and with a diapause period of only 55 days, transformed to pupa on March 1st. Becoming adult on the 19th, a male came to the surface of the ground on April 28th, and was dead June 7th, or 96 days less than a year after the grub had hatched.

Individual No. 47.5 hatched from the egg on November 24, 1933, molting to successive larval instars up to and including the ninth in 10, 17, 25, 36, 41, 56, 68 and 89 days, had a diapause period of 246 days, not becoming a pupa until October 25th of the next year. Development thereafter was rapid, however, a female adult weighing .32 gr. emerging from the pupal cell on December 22nd. She laid 2,109 eggs before being found dead on January 21, 1935, presumably having been murdered by 8.00, a male which still had his mandibular appendages. At death she weighed .313 gr.

Individual No. 47.4 had an even longer diapause period of 265 days, after having molted to eighth on the 89th day. A soft adult was noted in the pupal cell on December 2nd, but the female did not emerge until February 8, 1935. She began laying eggs on the 15th, and had laid 1,675 before March 15th, on which day she was found dead. The male with her, No. 5.6, had no

mandibular appendages. When she emerged from the ground she weighed .331 gr., and at time of death .35 gr.

Individual No. 47.00 was the slowest to grow of all the grubs hatching from the egg-cluster, but entering the diapause period from the seventh instar on the 74th day, was not observed making a cell until November 13th. The adult was first noted on December 8th, a female which came to the surface on February 12th, and laid 4,982 eggs before she was found dead on June 12th. At emergence from the ground she weighed .163 gr., and at death .157 gr.

Individual No. 5.5 hatched from the egg on January 5, 1934, molting to successive larval instars up to and including the eighth in 9, 18, 28, 38, 45, 66, and 94 days, and did not transform to a pupa until over a year from the time of hatching. An adult male weighing .17 gr. came out of his pupal cell on April 12th, and lived until July 1, 1935. At time of death he weighed only .055 gr.

Individual No. 5.2 almost exactly paralleled her brother, emerging from her pupal cell on April 9th, weighing .34 gr., and was released.

Individual No. 6.2 hatched from the egg on January 14, 1934, molting to successive larval instars up to and including the seventh in 11, 15, 27, 33, 52 and 80 days, pupating on November 27th, and transforming to adult on December 18th. The adult male came out of his pupal cell on January 21st, weighing .266 gr., and lived until June 26th, weighing .252 gr. at time of death. This male outlived the female 47.00, with which he was confined, and possibly may have murdered her, altho possessing no mandibular appendages at the time of emergence from the soil. A total of 537 days elapsed from date of hatching of the egg till the death of the male beetle.

Individual No. 6.7 molted to 6th in 56 days, but waited until the 113th day before molting again, and pupated 282 days later. The adult was noted on March 11th, but did not come to the surface until June 10th, a female weighing .286 gr., who was released.

Individual No. 7.1 hatched from the egg on March 1, 1934, molting to successive larval instars up to and including the

eighth in 14, 20, 30, 39, 63, 72 and 126 days respectively. After 264 days of waiting, it pupated on March 26th, 1935, the adult being noted on April 15th, and emerging as a male on May 11th, weighing .157 gr. He died on July 22nd, weighing only .095 gr. at time of death.

Individual No. 7.5 molted to the seventh larval instar in 135 days, but was observed in a cell by December 24th, and had become a pupa by January 4th. The male adult appeared March 29th, weighing .15 gr., and living until August 19th, at which time he weighed .16 gr.

Individual No. 7.4 molted to 9th on the 136th day, had become a pupa by October 24th and transformed to adult by November 11th. The female adult did not appear above ground, however, until March 12th of the following year. She lived until October 14th, and laid 5,219 eggs, at time of death weighing .193 gr.

Individual No. 7.6 molted to 7th on the 91st day, waiting until exactly one year after date of hatching before transforming to pupa. She appeared above the surface of the ground as a female beetle on June 7th, weighing .175 gr., was confined with her brother, 7.5, and laid 5,045 eggs before her death on October 26th. On the 18th, she weighed .246 gr., on the 23d, .222 gr., and when dead, .21 gr.

Individual No. 9.1 hatched from the egg on May 11, 1934, molted to successive larval instars up to and including the sixth in 20, 35, 50, 69, and 87 days respectively, but waited over a year after date of hatching from the egg before being observed to be forming a pupal cell. An adult male, weighing .153 gr. appeared above ground on June 19th, and died towards the end of October.

Individual No. 10.2 hatched from the egg on May 15, 1934, molted to successive larval instars up to and including the seventh in 36, 47, 65, 72, 83 and 122 days respectively, transformed to a pupa by January 21st and an adult by February 14th. A female adult weighing .127 gr. appeared on May 29th, began oviposition on June 17th, and by October 25 had laid 3,335 eggs, being confined with the male 9.1. On October 28th she weighed .222 gr., and on November 3d, .133 gr., apparently having died a day or two earlier.

Individual 935.1 hatched on June 7, 1934, from an egg-cluster collected at La Indiera in the mountains north of Yauco, and molted to successive larval instars up to and including the seventh in 14, 20, 28, 32, 47 and 98 days respectively. On September 13th, it weighed .408 gr., and on February 21, 1936, .269 gr., indicating a considerable loss of weight during the diapause period, altho this may in considerable part have been due to lack of attention for the preceeding month.

Individual No. 935.14 had just molted to the sixth larval instar on the 57th day after hatching, at which time the grub weighed .288 gr. When examined on February 22nd, it had become a male adult weighing .197 gr., which was released.

Individual No. 43.1 hatched from the egg on July 21, 1933, molting to successive larval instars up to and including the eighth in 22, 28, 34, 48, 52, 71 and 91 days respectively, and after a diapause period of something less than five months, was noted as a soft adult in the pupal cell on March 26th. Appearing above ground on May 7th, this was one of the females which, with 44.7 and 43.0, laid a total of 17,050 eggs. She died on July 16th.

Individual No. 43.0 grew just as rapidly up to the 5th instar, but after that the molts were on the 56th, 67th, 80th and 101st days. The pupa was observed on March 17th, and the soft adult on the 26th, the female appearing above the surface on May 7th. She was confined with 44.7 and her sister 43.0, and three males, being found dead on July 16th.

Individual No. 42.0 hatched from the egg on July 26, 1933, molted to successive larval instars up to and including the sixth in 12, 17, 35, 45, 52 and 92 days respectively, and was first noted as a pupa on March 20th. Transformed to a soft adult by April 4th, the male appeared above ground on May 11th, and had died by June 20th, or almost exactly a month less than a year after the egg was laid.

Individual No. 40.2 hatched from the egg on July 28th, 1933, molted to successive larval instars up to and including the tenth in 14, 21, 30, 39, 45, 54, 73, 81 and 102 days respectively, and was first noted again as a soft adult on March 26th of the following year. The female emerged on May 11th from the ground, and being confined with the male 42.0, who had

emerged on the same date, outlived him by only a week, laying 2,916 eggs before her presumably premature death.

Thus reduced to the essential outline, there appears to be such a similitarity about these case histories that the fundamental differences escape observation. It is only when the details of all of them are compared that the differences become obvious, as is indicated, it is hoped, in the first part of this paper. Looked at in another way, there is something touchingly human about these bare records, like those carved on the tombstones of a cemetery, only the wealth of incident due to a more complicated insect life-cycle necessarily gives them fuller detail between the two termini of birth and death.

SUMMARY

1. The females of *Diaprepes abbreviatus* L. lay 5,000 or more (or less) eggs in as few as two months, May and June, or in as many as seven months at other times of the year, often living over twice as long as do the males after emergence from the soil.

2. The incubation period of all eggs is seven days. Larvae attain full size in two to four months. A diapause period is absolutely essential before pupation. The pupal period is about two weeks. Fully-formed adults remain within the pupal chamber for a variable period of weeks or months, the length of this period and that of the diapause period of the larva being subject to great variation.

3. The great variation in the duration of the diapause period of the larva and before the emergence of the adult from the pupal cell in the ground permits some individuals to complete their life-cycle (hatching of eggs to first egg-cluster laid by female, or to emergence of male from soil) in less than eight months, but for other individuals it may extend for eighteen months (hatching of egg to last egg-cluster laid by female, or to death of male).

4. Deviation from a one-year life-cycle is of tremendous value to *Diaprepes abbreviatus* L. in enabling its eggs to escape attack by a common parasitic wasp, *Tetrastichus haitiensis* Gahan, which is most abundant during the late spring, but very scarce during autumn and winter.

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crown smooth, surface polished, slightly tumid in center behind ocelli, about three-fourths as long as wide basally, slightly more than half as long as pronotum, sides slightly sinuate in front of eyes which are well rounded externally and somewhat protruding. Pronotum behind slightly wider than head across eyes, only about two-thirds as broad as long, posterior margin very slightly concave, a very shallow transverse depression behind anterior border, lateral margins straight, converging cephalad. Clypeus narrow, nearly straight in lateral view, the disc flattened; antennae long. Rostrum very long, reaching posterior coxae. Tegminae rather narrow with three large, elongate anteapical cells, the inner cell about one-fourth shorter than outer two.

Genitalia: Female, last ventral segment long, about three and one-half times as long as preceding, the posterior margin greatly produced into a long, narrow, acute tooth; pygofer greyish white along ventral margin with sparse growth of dark bristles. Male plates with apex produced into a very long narrow process about as long as basal portion; margins of latter with fine long hairs.

Color: Above largely black with broad, sharply defined vittae and longitudinal blotches of light or pale blue and yellowish green. Crown largely covered by two broad, black, longitudinal vittae across disc, the narrower median vitta very pale blue and a buffy vitta next to each eye. Pronotum light blue, becoming very pale cephalad, the disc crossed by two straight, percurrent black vittae, the margins of these somewhat uneven, and a similar but narrower black vitta from behind each eye extending to about the center. Scutellum with center pale, the sides covered by a continuation of black vittae of pronotum; postscutellum brown. Tegminae black marked with paler as follows: Clavus with a large elongated blotch of yellowish green to greenish yellow extending obliquely caudad from anterior margin to about center; a similar, narrower band with rounded ends extending backward from below apex of this to near apex; *corium* largely covered by five large, light to somewhat pale blue, elongated blotches with a short, broad, paler, preapical fascia. Below largely black; clypeus and anteclypeus shining black, a continuation of the pale buffy spot above lorae. Thorax dull black, the legs dull orange yellow. Venter largely dull black, hind margins of segments yellow, and in female with the lateral margins also more or less so; pygofer largely black, pale ventrally. Abdomen above black. Wings strongly infuscated.

Length: 6.7 — 7.1 mm.

Holotype: Female and Allotype, Male, El Yunque Mt., Baracoa, Oriente Province, elevation 300 meters, June 10, 1935, F. de Zayas.

Paratype: One female from the same locality in the collection of the collector.

There is a specimen of *H. gundlachiana* in the Gundlach Museum labeled "361, Tettigonia sp." Gundlach records that this was also collected at Baracoa.

This species appears to be related to *Cicadella* (*Entogonia*) *constans* Walk. of Haiti, as figured and described by Dozier (1931 a: 6).

Hortensia conciliata n. sp. Fig. 6.

A rather small species with head considerably produced but well rounded in front, the crown, pronotum and scutellum brightly colored with broad longitudinal black and pink vittae.

Head rather strongly produced beyond eyes, well rounded in front, crown somewhat flattened, nearly four-fifths as long as broad at base, about five-sixths as long as pronotum (in female), sides not appreciably sinuate in front of eyes. Eyes of moderate size, slightly protruding. Pronotum as broad as head across eyes, short, less than sixth-tenths as long as broad, posterior margin shallowly, but distinctly concave, a light transverse depression behind anterior border. Postscutellum rather broad, apparently with a longitudinal median depression.

Color: Crown rich dull buffy pink, marked on each side with a broad black vitta with very uneven borders, this bifurcates behind ocelli, one branch continuing straight to posterior margin, the other narrower, continuing obliquely to internal angle of eye, the central pink area somewhat broader than lateral black vittae; ocelli yellowish surrounded by a narrow pale border. Pronotum buffy pink, concolorous with head, marked with four very broad black percurrent, uneven, vittae, thus forming alternate black and pink bands of about the same width, the two median vittae narrower anteriorly and joining those on crown; the posterior margin of pronotum appears narrowly pale pinkish. Scutellum pink and black concolorous with pronotum, median vitta from base to transverse impression and lateral angles black, the latter a continuation of two median vittae of

pronotum; postscutellum pale. Tegminae mutilated, basal half marked with black stripes along veins, the intervening pale areas pinkish and bluish grey. Legs pale testaceous. Abdomen red above.

Length: 5.50 mm., approximately.

Holotype; Female; "Guamacas; Cuba", Dr. J. Gundlach, in the Gundlach Museum, Havana, No. 277.

The foregoing incomplete description and accompanying figure were made from a single somewhat faded specimen through the glass cover of a sealed box in the Gundlach collection. This specimen is labeled "*Tettigonia conciliata* Uhler — 277". Gundlach records this number as collected at "Gumacas; Cuba". The latter locality is evidently Santiago de Cuba. Pedro Valdes Ragues published (1910) the manuscript name *conciliata* and the number of the specimen in Gundlachs collection with the observation "4mm., light brown, reddish".

No other species is known from Cuba with which this rare or very local form could be confused. It is apparently related to *Arezzia omaja* n. sp.

Poeciloscarta Stal

(Stal 1869a: 73)

Logotype *Cicada histrio* Fabricius 1794 a: 34.

This genus was established by Stal (1869a: 73) as a sub-genus of *Tettigonia* Oliv. for the following species: *cardinalis* Fabr., *cruenta* Fabr., *quadriguttata* Fabr., *marginella* Fabr., *laeta* Fabr., *pudica* Fabr., *quadrifasciata* Linn., *moesta* Fabr., *lyncea* Fabr., *histrio* Fabr., *tristis* Fabr., *suturalis* Fabr., and *pauperata* Fabr., all from South America and the West Indies. Van Duzee (1894a: 271) raised this group to generic rank but included only *lyncea* and *histrio*. Melichar (1926 a: 342) confines this genus to "Arten aus Madagaskar und Afrika" and erects a new genus *Cardioscarta* for "Arten aus Amerika". In 1932 a:285 he described the genus *Cardioscarta* and gave a key to and descriptions of 90 species, including three of the above, 52 previously described species and 35 new species.

We have selected *Cicada histrio* Fabricius (1794a:34) as the type of the genus *Poeciloscarta* Stal.

In this genus the head is broad, broader than the pronotum; blunt anteriorly; eyes prominent; the crown short, somewhat uneven. Pronotum nearly quadrangular. Tegminae with three

large anteapical cells, the radial and medial nearly quadrate; claval veins not united. Anterior tibiae ciliate.

In this genus the aedeagus is provided with a pair of elongate ventral processes.

Poeciloscarta histrio Fabr. Figs. 3, 33, 50.

Cicada histrio Fabricius 1794a:34

Tettigonia robusta Walker 1851b:777.

This species was described by Fabricius without definite locality. Walker redescribed it as *Tettigonia robusta*, also without definite locality. It is apparently one of the most common species in Cuba. It is a species of moderate size and robust form with short, broad, well rounded head; above largely buff, more or less pinkish, with dull pink tegminae, marked throughout rather evenly with strong black longitudinal stripes.

Head short and broad, somewhat variable in form; crown nearly evenly rounded in front to slightly triangular, concave before eyes, moderately long, shorter in male, slightly more than half as long as pronotum; eyes prominent; antennae of moderate length, apex of second segment visible from above; clypeus moderately tumid, very slightly flattened. Pronotum approximately three-fourths as broad as head across eyes, nearly two-thirds as long as broad, posterior margin slightly concave in center. Tegminae broadly rounded at apex, appendix relatively broad with three large anteapical cells, the inner cell larger, elongated, about twice the length of two preceding cells.

Genitalia: Female, last ventral segment three to five times as long as preceding, posterior margin produced into somewhat acute point, sides slightly convex, apex with small distinct, narrowly U-shaped notch, usually about one-half as wide as deep; pygofers with few pale brown bristles, mostly in irregular band on either side of ventral margin. Male, last ventral segment broader than long, about one-third longer than preceding segment, posterior margin broadly concave, plates small, extending about half the length of pygofers, relatively slender with elongated apices, external margin without row of large bristles, with few minute brownish bristles intermixed with fine pale hairs.

Color: Above, crown buff, often suffused with pink, especially on either side of median line, marked with four strong longitudinal, rather evenly spaced, black vittae; the two inner

vittae usually percurrent, unbroken, parallel, margins somewhat undulating; intermediate vittae much more uneven, broken before ocelli, a narrow fascia connects inner and intermediate vittae anterior to ocellus; a narrow incomplete median vitta often present; eyes dark brown. Pronotum buff, sometimes suffused with pink, the anterior and lateral margins broadly paler, the disc crossed by four, strong, evenly spaced, nearly percurrent, black fasciae, the space between the inner and intermediate fasciae frequently washed with very pale orange yellow; an elongated black patch behind each eye extending about two-thirds the distance to posterior margin. Scutellum and post-scutellum buff, the inner pair of fasciae of pronotum continued over scutellum to transverse impressed line. Tegminae below entirely red except translucent apical area, appearing pale to deep dull pink above, heavily marked with black longitudinal veins to base of anteapical cells, cross veins at bases of anteapical cells irregularly marked with black, costal area from base largely washed with opaque yellow; cells bordering claval suture and inner angle of clavus usually suffused with pale yellow; translucent apical area dark fuscous divided by a paler transverse fascia preceded by a variable transparent white patch next to costal margin. Below pale buff marked with black, head and pleurae often suffused in part with pink. Clypeus with two longitudinal black stripes on either side which unite below, then continue inwards unite again on base of anteclypeus and continues as a broad stripe to apex; the two inner stripes of clypeus often gradually broadened above, usually not connected with stripes on crown; lateral pair of stripes usually in part connected by numerous incomplete black dashes which often cross the uneven lateral stripes. Legs deep buff to brownish, a dusky streak on femora behind near apex and on corresponding portion of lower surface of tibiae. Each segment of abdomen below with a pair of fuscous black spots, last segment of female with similar large macula on disc, the apex embrowned; in male the dark maculae on sides of posterior ventral sclerites fuse behind at apex forming two or three broad arcs. Abdomen above bright crimson. Wings translucent brownish fuscous with darker veins.

Length: 6.1—6.5 mm.

Redescribed from numerous specimens from various localities throughout Cuba, including Taco Taco (E. E. A. de Cuba

No. 8772) and Sierra Rangel, Pinar del Rio Province; Santiago de las Vegas (E. E. A. de Cuba No. 10028), Havana Province; Peninsula de Zapata and Trinidad Mts., Santa Clara Province, Camaguey, Camaguey Province, Nagua (E. E. A. de Cuba No. 8893), Santiago de Cuba, San Nicolas and Baracoa, Oriente Province.

This common species occurs on a wide range of plants of different families, both cultivated and wild. Dr. J. C. Myers (1928d) refers to it as the Croton Leafhopper as he found it very abundant on *Codiaeum variegatum* (L.) Bl. near Cienfuegos, Cuba. The junior author has found adults and nymphs on a small composite weed, *Vernonia cinerea* (L.) Less. at Santiago de las Vegas. A. R. Otero found it breeding at the same locality on a garden plant, *Aloysia triphylla* (L. Her) Br., and we have specimens reared on *Ocimum bacilicum* L. by C. H. Ballou. It is also found occasionally hiding in the whorls of sugar cane leaves. At San Nicolas, Oriente, it was found rather numerous on coffee plants, *Coffea arabica* L.

The nymphs are suggestive of the adults being whitish and pale yellow heavily marked with black and dusky.

In order to fix as definitely as possible the identity of the present species specimens were sent to the British Museum and there very kindly compared with the type of *Tettigonia robusta* Walk. by Mr. W. E. China who found them conspecific. The latter was synonymized with *Tettigonia histrio* of Fabricius by Stal. This matter has already been considered by Myers in the paper cited above. While the present form is the same as that treated by the latter author and also that of the Gundlach Museum (labeled *Tettigonia robusta* Sign.) it is by no means certain that it is the species referred to as *histrio* by other recent authors. Osborn (1926c:340) speaks of *histrio* as having the lines on the tegminae interrupted but otherwise very similar to *sirena* Stal. However, the true *histrio* has the black lines on the tegminae relatively even and continuous. Furthermore, *sirena* is certainly very different from anything known in Cuba, or in Puerto Rico, from which Islands it has been reported in various recent publications. Stal described *sirena* (1864a:76) as an insect 8½ to 10 mm. in length with the abdomen fuscous above. *Poeciloscarta histrio* is much smaller (6-6½ mm.) with the abdomen bright crimson above. Fowler's illustration of *sirena* (1899d: Pl. 16, fig. 18) made from the type also indicates an entirely distinct species.

Poeciloscarta histrio var. *baraguensis* n. vr. Fig. 29.

In general plan of coloration, form and structure resembling *P. histrio* Fabr. but readily distinguishable by heavier black markings, brighter colors and by distinctly larger size.

Genitalia: External genitalia not appreciably different from *histrio* except that notch in produced apical margin of last ventral segment of female is relatively broader in the specimens at hand, this being intermediate in form between that of *laticeps* and *histrio*.

Color: The black stripes strongly marked, broader than in *histrio*, the four on disc of pronotum usually percurrent and rather uniform in width. The ground color of head and thorax pale, glossy, the disc of pronotum on either side of center, between inner and intermediate stripes, and lateral angles of scutellum heavily washed with orange or orange red. Tegminae with costal area and clavus externally deep yellow. Below resembling *histrio* except for stronger black markings, the two inner stripes of face usually continuous with those on crown, not broken at apex of head, and without transverse row of narrow black dashes between these and intermediate vertical stripes. Legs with femora orange or light red, brighter on the posterior pair and contrasting with pale buff tibiae.

Length: 6.5 - 7.5 mm.

Holotype: Female, Central Baragua, Camagüey, July 26-27, 1927, C. F. Stahl and S. C. Bruner.

Allotype: Male, same locality.

Paratypes: Seven specimens from same locality, and Isla de Pinos, March 1, 1923, S. C. Bruner.

This relatively large, strikingly marked form appears very different from the common *histrio*; the internal genitalia are practically identical. Its food plant has not been determined.

Poeciloscarta cardini n. sp. Figs. 8, 27.

A rather elongate, subparallel species of moderate size with prominent eyes, horizontal sculptured vertex and narrow impressed pronotum; unevenly striped with black above, the head and thorax buff, the tegminae rose pink; abdomen red above.

Head somewhat produced, narrowly rounded or slightly pointed in front; crown horizontal, a longitudinal median

depression at base and broader lateral depression next to eyes, the apex slightly prominent above, about three-fourths as long as broad, about two-thirds as long as pronotum, shorter in male; eyes prominent, strongly rounded externally, not forming even curve with crown; antennae relatively long, nearly as long as head and thorax combined; face normal, disc slightly flattened, forming angle of about 55 degrees with crown; anteclypeus bent upward before center, forming a prominent obtuse angle in lateral view. Pronotum considerably narrower than head across eyes, about two-thirds as long as broad, a deep impression on either side in front, disc behind moderately convex, smooth, posterior margin nearly straight. Tegminae somewhat elongated with subparallel lateral margins, apex obtusely rounded, almost subtruncate, three large elongate anteapical cells of about same length.

Genitalia: Female, last ventral segment nearly two and one-half times as long as preceding, posterior margin produced, forming about a right angle, the apex with a short tooth; pygofers with few dark bristles behind ventral margin. Male, abdomen very small, last ventral segment transverse, slightly more than twice as broad as long, posterior margin straight; valve minute forming a nearly equilateral triangle; plates slender, about two and one-half times as long as last ventral segment, somewhat longer than pygofers, apices somewhat flattened, twisted and bent outward in dried specimens, external margins with few minute bristles only.

Color: Crown buff or pale yellow, often lightly washed with brown on either side of apex, with irregular black longitudinal markings as figured, leaving a broad median band and area between ocelli and eyes pale. Pronotum buff, often somewhat brownish, with six more or less broken and variable, broad, longitudinal black or fuscous stripes, the central stripes narrower and parallel; anterior margin often paler, the broad lateral margins pale yellow. Scutellum buff or pale yellow, a black mark on either side at base, narrowed behind and extending to transverse depression and there prolonged inwards; often a smaller median dark spot at base; postscutellum pale yellowish. Tegminae jasper red varying in intensity, sometimes with a lilac tint, marked along veins with broken black stripes and variable elongated blotches, intervening areas often washed with paler; an indefinite pale, broad, somewhat oblique transverse fascia usually distinguishable behind center preceded by darker

indefinite band; apical area lightly infuscated, translucent, preceded by pale macula on costal margin, disc before apical margin and around anal angle largely pale; commissure pale yellow. Below buff or yellowish white usually heavily marked with fuscous and brown. Face with row of four narrowly spaced large black spots across upper margin, the two central spots larger, continued from crown; a somewhat sinuate row of 6 to 9 oblique dark brown arcs on sides beneath lateral spots, these gradually shortened below and fused near apex, then united with broad fuscous brown median stripe, which is continued, gradually narrowed, to about center of anteclypeus. Lorae with inner margin broadly fuscous. Genae with elongate irregular fuscous area from lower margin of eyes to behind lorae. Thorax with large fuscous patches. Legs pale, usually with more or less distinct, incomplete, fuscous basal and preapical bands on femora; a row of small dark spots at base of spines on outer side of posterior tibiae and a similar row of smaller spots beneath; these markings largely obsolete on pale specimens. Female with sides of ventral sclerites, pygofer at base, and center of pleural sclerites more or less infuscated; genital segment with large fuscous median patch over base, apical margin embrowned the pygofer with sides more or less pinkish. Venter of male and plates somewhat infuscate. Abdomen above and lateral margins of venter bright crimson. Wings light fuscous.

Length: 7 - 8 mm.

Holotype: Female, Las Animas, Sierra Rangel Mts. Pinar del Rio Province, August 2, 1929, J. Acuña and S. C. Bruner.

Allotype: Male, Cienaga de Zapata, Santa Clara Prov., July 10, 1920, S. C. Bruner, on *Morinda roioi* Lin. (E. E. A. de Cuba No. 8548).

Paratypes: Specimens from Sierra Rangel, Pinar del Río, J. Acuña; Santiago de las Vegas, on *Terminalia catappa* Lin., A. R. Otero; Ceballos, Camagüey, P. Cardín; Baracoa, Oriente, S. C. Bruner and L. Bouclé; Nagua, Oriente Prov., July 29, 1922, S. C. Bruner and C. H. Ballou.

This unique form while widely distributed in Cuba is not commonly seen and usually only solitary individuals have been taken in sweeping woodland vegetation. It is apparently related to *Cicadella dubiosa* Dozier of Haiti, but may be easily distinguished by shorter vertex, distinct genitalia, and distinct markings and general coloration.

The species is dedicated to the former entomologist of the Cuban Experiment Station, the late Patricio Cardin, who collected the first specimen obtained.

Poeciloscarta laticeps n. sp. Figs. 7, 30.

Closely related and very similar to *Poeciloscarta histrio* Fabr., but having a somewhat shorter and broader head, narrower, more irregular and broken black vittae, these alternately thickened and narrowed on tegminae; general coloration browner, the tegminae eosine pink; genitalia distinct.

Head short and broad with prominent eyes; crown very broadly rounded anteriorly, somewhat more than twice as broad as long, about three-fifths as long as pronotum, slightly shorter in male. Clypeus moderately tumid in lateral view forming a broad, nearly regular curve with anteclypeus. Pronotum only about four-fifths as broad as head across eyes, scarcely three-fifths as long as broad. Tegminae broadly rounded at apex, apical margin largely subtruncate, appendix unusually broad; three anteapical cells, the outer and intermediate cells rather small, roughly oval and subequal, the inner cell elongate, about twice the length of others.

Genitalia: Female, last ventral segment nearly three times as long as penultimate, posterior margin somewhat produced and gradually narrowed, the apex with a shallow, nearly evenly rounded notch, pygofer with few brownish bristles. Male, last ventral segment much broader than long, somewhat longer than penultimate, posterior margin straight; plates small, extending about two-thirds the length of pygofer, relatively narrow, tapering to slender apices, without regular row of conspicuous marginal bristles.

Color: Crown, pronotum and mesonotum pale buff above, marked with irregular black longitudinal vittae. Crown usually with a median line from base, broadened anteriorly, and not extending to apex, sometimes, reduced to a mere spot behind apex. Pronotum with black markings as follows: An inner pair of more or less continuous vittae extending from behind anterior margin to about four-fifths distance to hind margin, more approximate anteriorly; on either side of these an intermediate sub-parallel vitta of about same length, usually broken into spots anteriorly; a much broader and shorter vitta from behind eyes extending about two-thirds length of pronotum. Scutellum pale buff, with a broad black vitta on either side from base to slight-

ly beyond transverse impressed line, sometimes connected at apex by narrower fascia along impressed line; lateral angles often faintly orange; postscutellum buffy. Tegminae below light brown washed with rose red from base through disc to anteapical cells and through center of clavus showing on upper surface as pale brown and pink; veins narrowly marked with a large, transparent patch from costal margin including most of first anteapical cell, followed by transverse black or fuscous band which curves forward to apex of inner anteapical cell; remainder of apical area smoky hyaline except apical margin which is rather broadly fuscous black; costal area washed with opaque yellow over approximately anterior two-thirds. Below pale buffy yellow marked with black, the pleurae washed with yellow. Clypeus with two vertical black stripes on either side which originate near base, unite below at acute angle before apex, continue inward, fuse on base of anteclypeus and extend as a single broad band to apex; the two inner stripes of clypeus abruptly enlarged at upper extremity and there more approximate; each lateral pair of stripes connected by numerous, usually incomplete, oblique black dashes. Legs largely brownish buff; posterior tibiae usually washed with pale yellow; a dusky streak on femora behind near apex and on corresponding portion of lower surface of tibiae. Each segment of abdomen below with a pair of black spots in the female, these connected to form a black crescent in the male; last segment of female with a similar large broadly oval macula on disc, the posterior margin somewhat embrowned; the pleural sclerites with a median longitudinal fuscous dash. Abdomen above bright crimson. Wings largely pale brownish fuscous with darker veins.

Length: 6 - 6.5 mm.

Holotype: Female, El Cobre, Oriente Province, October 5, 1928, F. Silvestri and S. C. Bruner.

Allotype: Male, Omaja, Oriente, July 24, 1932, S. C. Bruner.

Paratypes: One female, Manacas, Santa Clara Province, S. C. Bruner; one female, Santiago de las Vegas, A. Otero, three males and five female Omaja, Oriente, S. C. Bruner; one female, Barrio Caobilla, Camegüey, June 23-25, J. Acuña; one female, Casa Baragua, June 26, C. F. Stahl and S. C. Bruner; one female and one male, S. Nicolas, Ote, July 20, S. C. Bruner on *Coffea arabica*; and one female, Jaranu, S. C. Bruner.

Cicadella Dum.
(Dumeril 1817b: 189)

Logotype *Cicada viridis* Linne 1758a: 438

This genus has had numerous species assigned to it since Van Duzee reestablished it in 1916. There are no Cuban species in this genus as we have restricted it here. A reexamination of *C. viridis* (Fig. 51) shows the following characters: Crown broad, sometimes strongly produced, obtuse anteriorly; ocelli deeply impressed; clypeus strongly inflated; eyes prominent. Pronotum about twice as broad as long, anterior margin broadly curved, lateral margins short, posterior margin nearly straight. Tegminae with three large anteapical cells. Aedeagus with elongate anterior, ventral and posterior processes.

Cicadella sanguinicollis Latr.

Tettigonia sanguinicollis Latreille 1811a: 191

While described from Cuba nothing remotely resembling this highly colored species has since been found there, and it seems practically certain that there has been a mistake with regard to the origin of the type. Judging from Signoret's description and figure in his "Revue" it seems likely that it was really obtained in some continental locality in the Neotropical Region. Its length is given as 16mm., very much longer than any other Cicadellid known from Cuba. It is therefore not considered in the present work. According to the fauna of this country. The type was in Signoret's collection.

Kolla Dist.
(Distant 1908g:223)

Orthotype *Kolla insignis* Distant 1908g:223.

This genus was described to include two species from India. It has been extended since to include 37 species from all parts of the World. We are not convinced that all these species are congeneric but until the type can be restudied in comparison with the other species we prefer to assign the species listed below to this genus.

The genus *Kolla* Dist. as represented by our Cuban species may be characterized as follows: Head nearly as broad as pronotum; crown broadly rounded the anterior margin continu-

ing the contour of the eyes; cheeks below antennae distinctly carinate; front tibiae ciliate; radius branching before the apex of clavus; media and cubitus unbranched before the membrane; claval veins not united. Crown and pronotum in the known species transversely fasciate; aedeagus with the ventral processes elongate, as long as the pygofers.

Kolla fasciata Walk. Figs. 14, 28

Tettigonia fasciata Walker 1851b: 780

Fasciata was described from the United States and has been reported from the West Indies, Mexico and Central America. Van Duzee considers *fasciata* as a variety of *bifida* Say. We believe, however, that the Cuban material is specifically distinct from that of North America. This species might be confused with *carabela* as it has the same general color pattern, the essential differences being that in *fasciata* the anterior margin of the pronotum is ferruginous and the veins are broadly bordered with black.

Kolla carabela n. sp. Figs. 36, 52.

This species has been recorded as *Kolla geometrica* Sign. which was described from Colombia and has been reported from the West Indies, Central America, Mexico, and the Southeastern United States. We do not believe, however, that the species from Cuba is the same as the one reported from the Southeastern United States. We have named the Cuban species *carabela* until the species from Colombia can be reexamined.

The specimens from Cuba are generally dark green above marked with black and yellowish green. The anterior border of the pronotum is black, and the veins of the tegminae narrowly bordered with black. This species is widely distributed in Cuba, having been collected in practically all the areas where extensive collections have been made.

Head nearly as wide as the pronotum; crown short, slightly produced on median line, about three-fourths as long as the pronotum. Pronotum nearly twice as broad as long; the anterior margin broadly curved, the posterior margin slightly concave.

Color: Crown black the posterior border greenish yellow, a broad greenish yellow fascia anterior to ocelli projecting on median line to anterior of the crown, and including a small black spot. Pronotum mostly dark green, anterior margin black bordered posteriorly by a greenish-yellow fascia; posterior

border greenish-yellow bordered anteriorally with black. Scutellum greenish yellow with the anterior border and the impressed line black. Tegminae dull green, the apical transparent area infuscated; the veins narrowly fuscous or black. Face largely testaceous, with two large black spots dorsally. Genae and lorae black. Legs dull yellow. Abdomen testaceous.

Length: Female 5.25 mm. Male 3.5 - 4 mm.

Holotype: Female, Sierra Rangel, August 29, 1927, J. Acuña.

Allotype: Male, Sto. Tomás, May 5 - 9, 1927, S. C. Bruner and J. Acuña.

Paratypes: Eleven females, Santiago de las Vegas, Havana, Sto. Tomas, Sierra Rangel, Bahia Honda, and ten males from Santiago de las Vegas, Carabela, Santiago, Las Animas, Jara-hueca.

Ciminius gen. n.

Orthotype *Tettigonia harti* Ball 1901b: 61.

This genus may be distinguished from other Cicadellid genera by the peculiar venation and genitalia. It comes closest to *Kolla* Distant.

Crown triangular broader than long; the anterior margins continuing the margins of the eyes; the dorsal surface sloping to meet the slightly inflated face. Pronotum broad. Scutellum broad. Tegminae short; cell radius one without an apical cell; with a medial anteapical cell. Anterior tibiae ciliate. Posterior tibiae with a few coarse spines not ciliate.

Ciminius harti Ball Figs. 34, 53.

Tettigonia harti Ball 1901b: 61

This species was described from the Southern United States and Cuba. It may be recognized from other Cuban species by its small size, tegminae dark brown or dull black with veins pale.

Head conical; crown obtusely rounded, twice as wide as long, about two-thirds as long as pronotum.

Female last ventral segment nearly truncate, slightly incised either side to form a small median tooth. Male plates about half as long as pygofer, broad at base tapering to elongate points.

Color: Female brownish. Crown with light slightly curved fascia across apex in front of ocelli and a pair of black spots on

posterior border behind ocelli. Pronotum buffy, irregularly marked with brown. Tegminae brown with veins buffy. Face with numerous dark brown arcs; apex and median area pale. Male darker dull black with numerous pale markings.

Collected from several localities in Cuba as follows: Baragua, Bahia Honda, Santiago de las Vegas, Casa Blanca, Nagua, Corralillo, Herradura, Pinar del Rio Province. Osborn records it from Camagüey Province.

Hadria gen. n.

Orthotype *Hadria convertibilis* n. sp.

This genus may be distinguished from the other Cuban genera by the broad obtuse head; by the simple venation; with tegminae heavy and opaque, veins straight with two anteapical cells. Anterior tibiae strongly ciliate. Male aedeagus simple with a pair of posterior processes.

Hadria convertibilis n. sp. Figs. 11, 35, 54.

A woodland species of moderate size, usually black above heavily marked with numerous light bluish slate and greyish white variable stripes, lowland varieties often more or less washed with yellow; below largely yellow; dorsum of abdomen black.

Head rather short and broad, somewhat triangular with obtuse apex nearly evenly rounded in front; crown slightly more than one-half as long as broad and about three-fifths length of pronotum. Face moderately convex, disc slightly flattened above. Anteclypeus somewhat prominent in center. Pronotum slightly narrower than head, disc with very faint transverse striae. Tegminae moderately broad.

Genitalia: Female, last ventral segment long, about two and one-third times as long as preceding, posterior margin moderately produced into an acute angle with sides sinuate; pygofer with few scattered brown bristles. Male, last ventral segment nearly one-half broader than long, about one-third longer than preceding, posterior margins straight, plates nearly as long as pygofer, apices not produced, rather obtuse, external margins almost straight, with row of pale stiff hairs or slender bristles.

Color: Above largely black heavily striped with paler as follows: Vertex usually with two more or less percurrent, narrow, approximate greyish or yellowish white median stripes,

often broken near apex; two or three parallel yellowish arcs on either side of apex, a greyish or yellowish white irregular oblique stripe passing from inner side of ocelli to behind inner angle of eyes and another similar dash from anterior margin of eyes. Pronotum with two approximate median spots on anterior margin, with two or three smaller irregular spots on either side, greyish white; two broad, parallel vittae from behind median spots and a band of irregular spots on either side along outer paler stripe usually brownish grey or slate colored. Scutellum with a more or less ring-like greyish or yellowish white mark at base on either side and beyond the transverse impressed line two, similar, more or less confluent, stripes converging apically; postscutellum greyish white. Tegminae heavily marked over entire surface with slate grey, more or less broken, uneven, variable stripes, about as wide or wider than intervening black areas; costal cell anteriorly more or less washed with greyish white; translucent apical area dark fuscous with a short well marked white transverse fascia from costal margin to base of third apical cell. Below largely yellow, sometimes more or less suffused with brownish fuscous. Face deep yellow in center with a fuscous spot at apex, sometimes obsolete, usually lightly infuscate on either side and marked with some six or seven oblique parallel pale yellowish stripes; remainder of face yellowish usually without distinct darker markings. Sternum yellow with two dark indefinite maculae on mesosternum. Rostrum and legs buffy yellow or light yellowish brown, tarsi darker. Venter clear yellow; produced apical portion of genital segment of female more or less infuscate; pygofers ventrally greyish white. Abdomen above fuscous black. Wings fuscous with darker veins.

Length: 6 - 7 mm.

Holotype: Female, and Allotype: Male, Las Animas, Sierra Rangel, Pinar del Rio Province, altitude 1,500 ft., April 28, 1933, S. C. Bruner and A. R. Otero.

Paratypes: Many specimens from same locality, J. Acuña, C. H. Ballou, A. R. Otero, S. C. Bruner; Santiago de las Vegas; Los Sabalos, Zapata Swamp (on *Chrysobalanus icaco* Lin. — E. E. A. Cuba No. 8542) and Santo Tomás, P. de Zapata; Santa Clara Province, S. C. Bruner and J. Acuña; Barrie Caobillas, Camagüey Prov., J. Acuña; Nagua, C. H. Ballou and S. C. Bruner, (E. E. A. Cuba No. 8888), Santiago de Cuba, F. Silves-

THE CICADELLIDAE OF CUBA

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The present paper is one of a series of papers on the homopterous fauna of Cuba (Metcalf and Bruner 1925a, 1925b, 1930a). The homopterous fauna of Cuba has been sadly neglected but we hope to publish systematic reviews of all the families. At the time this paper was prepared the literature recorded 5 species of Cicadellidae from Cuba. The present paper records no less than 32 species and varieties.

HISTORY

The earlier writers, notably Walker (1851b) and Signoret (1853a, b, c; 1854a, b, c, d; 1855a, b, c, d), contributed greatly to our knowledge of this family especially in relation to the Cuban fauna. Guérin-Meneville (1856a, 1857a) mentions but a single species. Osborn (1926a) mentions the economic relations of three Cuban species.

Melichar (1924a, 1925a, 1926a, 1932a) started a monograph of the genera and species of this family but unfortunately this has not been completed and many new genera he proposed in his keys have not been established. Osborn (1926b) reviewed the Neotropical species and described many new species from South America and he also (Osborn 1935a) reviewed the species from Porto Rico and the Virgin Islands, several species being common to Cuba.

CLASSIFICATION

This group has been variously classified as a tribe, subfamily and family. Baker (1923a) was the first, to clearly establish this group as a family and in our opinion it is entitled to this rank. It may be distinguished from the other jassids by

the following characters: Body not greatly flattened; ocelli on the crown; lateral clypeal sutures continued onto the crown.

The following key will aid in the differentiation of the generic and subgeneric groups.

KEY TO THE GENERA OF CUBAN *CICADELLIDAE*

- A. Anterior tibiae sulcate or dilate apically; tegminae narrow not covering lateral margins of abdomen. Antennal ledges prominent. Subfamily *Proconiinae* (No members of this subfamily have been found in Cuba).
- AA. Anterior tibiae slender, terete or prismatic; antennal ledges not prominent; tegminae broad. Subfamily *Cicadellinae*
 - B. Tegminae reticulate apically. Tribe *Draeculacephalini*
 - C. Crown flat with a definite edge; face in profile nearly straight. *Draeculacephala* Ball
 - CC. Crown and face conically produced margins rounding; face in profile inflated. *Carneocephala* Ball
 - BB. Tegminae not reticulate apically. Tribe *Cicadellini*
 - C. Radius branching forming a distinct first radial cell
 - 1. Three large anteapical cells. 1
 - 1. With one or two subapical cells. 2
 - 2. Head broader than pronotum, obtuse anteriorly; eyes prominent. 4
 - 2. Head not as broad as pronotum, conically produced anteriorly; eyes not prominent. 3
 - 3. Anterior margin of crown continuing the outer margin of the eyes; pronotum about two-thirds as long as broad, the anterior lateral angles rounded continuing the curve of the anterior margin. *Poeciloscarta* Stal.
 - 3. Anterior margin of crown not continuing the outer margin of the eyes; pronotum nearly twice as broad as long, anterior lateral angles distinct. *Cicadella* Dumeril
 - 4. With two large subapical cells, first radial and medial *Ciminius* Metcalf and Bruner
 - 4. No anteapical cell save first radial. 5
 - 5. Crown elongate broadly rounded on anterior margin. *Entogonia* Melinchar
 - 5. Crown much broader than long. *Kolla* Distant

- CC. Radius unbranched before apical cells; antepical cells small or very small----- 1
1. Head conically produced; tegminae attenuated caudad *Lucimius* Metcalf and Bruner
1. Head not conical; tegminae broadly rounded caudad ----- 2
2. Crown elongate; male aedeagus simple with a pair of posterior processes-----
Hadria Metcalf and Bruner
2. Crown usually much broader than long; male aedeagus complex with an asymmetrical process --*Arezzia* Metcalf and Bruner

MORPHOLOGY

In the past emphasis has been laid on the shape and relative proportions of the crown, the position of the ocelli, the character of the venation and the external genitalia especially in the differentiation of the genera and species. In our opinion more emphasis must be placed in the future on the finer details of the venation and the internal genitalia. For that reason careful drawings have been made of the internal male genitalia of all the species considered in this paper where males were available. Drawings of the head characters and external genitalia are also included.

Certain terms which are used in this paper need to be defined. The head of an insect may be considered as an elongate six-sided box. The surfaces can then be named without reference to their morphological composition which will vary in the different families. The dorsal surface is called the crown in this paper not the vertex as it contains other elements besides the vertex. The anterior surface is called the face. In the cicadellids it is made up largely of the clypeus and anteclypeus. The lateral surfaces are called the cheeks. They are composed largely of the genae and mandibular sclerites (lorae). The ventral surface is the oral surface and the posterior surface is the base.

The anterior wings are the tegminae. They are fairly heavily chitinated in the cicadellids and are divided into three general areas - the anterior (costal or ventral) basal, corium; the posterior (anal or dorsal) clavus; and the apical membrane which is more or less translucent. The corium contains four principal veins, the costa, along the costal margin, the radius, the media and the cubitus anterior. The cubitus posterior separates the corium from the clavus. The membrane is usually

occupied by the apical cells formed by simple cross veins between the principal longitudinal veins or by branching of these veins. Due to the fact that the tegminae are relatively opaque in cicadellids the venation is frequently obscured but is usually distinct if viewed from the inner surface.

The female genitalia are of the usual homopterous design. The shape of the last ventral segment is specifically distinct. The genitalia proper consist of the swollen pygofer, the sheaths of the ovipositors and the ovipositors.

The male genitalia are complicated. The shape of the last ventral segment is not distinctive. Apically there is the median unpaired valve, sometimes concealed by the last ventral segment, sometimes absent; the paired genital plates and the pygofer. The relative shapes, sizes and details of these structures seem to be specific. The internal male genitalia are very complicated. They consist of a pair of genital styles and an unpaired aedeagus. The aedeagus is made up of: A basal connective which unites it to the styles; a basal shaft; and, typically, a pair of dorsal processes; a pair of ventral processes; a pair of posterior processes and an apical lobe. So far as the writers are aware the characters of the internal male genitalia are always distinctive. And if considered in their broader aspects may give good characters for the distinction of generic and subgeneric groups.

NOMENCLATURE

In practically all groups of insects there is much confusion in nomenclature due in great part to the inaccessibility of the literature and frequently to a failure to apply the strict rules of nomenclature as laid down by the International Zoological Congress and elaborated by Banks and Caudell and the British National Entomological Commission. There has been a failure also to recognize the importance of correctly established genotypes.

The confusion in the use of the names *Tettigonia* and *Cicadella* is a case in point. As nearly as we can determine, the facts in this case are as follows:

Linne (1767a: 692-703) divided the genus *Gryllus* into a number of subgenera one of which he called *Tettigonia*. These

are apparently genuine Orthoptera. In 1762, 1766 and 1799 Geoffroy (1762a: 429) contrasted *Cicada* with *Tetigonia* (sic) but he did not follow binary nomenclature and mentions no species as belonging to *Tetigonia*, therefore, this name has no standing today. Fabricius (1775a: 678) used the name *Tetigonia* for the larger Homoptera which we now place in the Family CICADIDAE and the name *Cicada* for all the smaller Homoptera now placed in the membracids, cercopids, jassids and fulgorids. In this he was not followed by subsequent writers who followed Olivier (1789a: 24) using *Cicada* for the members of the Family CICADIDAE and *Tettigonia* for jassids. This in general was followed down to about 1900 with the genus *Tettigonia* being more and more restricted and used with *Cicada viridis* Linne as the implied type. In 1900 Kirkadly tried to revive the spelling used by Geoffroy but Jacobi (1904a: 778) proposed the new name *Tettigoniella* to replace the name *Tetigonia* Olivier and subsequent writers. Jacobi does not give a definite type for *Tettigoniella* but his reference to "*Tetigonia* Geof. fur *Cicada viridis* L." would lead one to believe that he intended *C. viridis* as the type of *Tettigoniella*. This is definitely stated by Distant (1908a: 516).

In 1916a: 66 and 1917b: 595 Van Duzee receive the name *Cicadella* crediting it to Latreille 1817a: 406 and placing *Tetigonia* Geof., *Tettigonia* Oliv. and *Tettigoniella* Jac. as synonyms giving as the orthotype *C. viridis* Linne. This is not correct, however, as Latreille (1817a: 400) divided the Homoptera into three families: 1) Cicadaïres, 2) Aphidieus, and 3) Gallinsectes. The first of these was divided into three groups not genera "Cigales proprement dites" genus *Cicada* Oliv.; "Les autres Cicadaïres" genera *Fulgora* Linn., *Flata*, *Issus*, *Derba* and *Delphax*; and "Les Cicadelles (Cicadella)" with the genera *Ledra* Fab., *Membracis* Fab., *Cercopis* Fab., and *Tettigonia* including the genera *Cicada* Fab. and *Iassus* Fab. Thus *Cicadella* would include all the members of the leafhoppers except the LEDRIDAE. No mention is made of *C. viridis* Linne. This same scheme was followed by Latreille (1829a: 209) except that the genera *Otiocerus* Kirby, *Lystra* Fab., *Civius* Latr., *Poeciloptera* Latr., *Anotia* Kirby and *Asiraca* Latr., are added to the "Cicadaïres (muettes)" and the genera *Tragopa* Latr., *Darnis* Fab., *Bocydium* Latr., *Centrotus* Fab., *Aetalion* Latr., *Ciccus* Latr., *Eulopa* (sic) Fall., *Eupelix* Germ., *Penthimia*

Germ., *Jassus* Fab., and "Les Cicadelles propres ou Tettigones" (Tettigonia Oliv., Germ.—*Cicada* Linn., Fab.) are added. There is still no mention of *Cicada viridis* in any way. So far as we can discover this general scheme was used by the various translators of Cuvier's "Le Regne Animal". But Blanchard (1849a: pl. 99) gives in the explanation "Genre Cicadelle, *Cicadella* Latr. *Tettigonia* Oliv. Fig. 6 *Tettigonia viridis* Linn, and the name *Tettigonia viridis* was repeated on the plate.

In 1802 Latreille (1802a: 261) divided the genus *Tettigonia* into two divisions with *Cicada cuspidata* F. in one and *Cicada viridis* L. and *Cicada lanio* F. in the other.

In 1806 Dumeril (1806a: 267) gives a key to the genera of Homoptera including *Cicadella* which is briefly described on the preceding page. In 1817 Dumeril (1817b: 189) gives a good definition of the genus *Cicadella* and lists four species *C. vittata*, *C. viridis*, *C. interrupta* and *C. ulmi*. Dumeril has page priority over Latreille and Dumeril definitely indicated *Cicadella* as a genus, therefore, it clearly has priority. Sherborn (1925a: 1273) accepts this. *Cicadella* Dumeril will have as its logotype *Cicada viridis* Linne, a palearctic species.

The genotypes of the other genera are indicated under the discussion of each genus.

KEY TO THE SPECIES OF CUBAN *CICADELLIDAE*

- A. Apical portion of tegminae behind clavus more or less reticulate-veined; head acutely angular.
 - B. Crown flattened with definite margins, largely pale; face in profile nearly straight-----*Draeculacephala cubana* Metcalf and Bruner
 - BB. Crown convex with indefinite, rounded margins, largely rufous; face inflated
 - C. With many small reticulations on the apex of tegminae -----*Carneocephala flaviceps* Riley
 - CC. With a few coarse reticulations on apex of tegminae -----*Carneocephala reticulata* Signoret
- AA. Apical portion of tegminae without reticulate veins; head usually not distinctly angular.
 - B. Abdomen black or brownish above.
 - C. Species mainly green above ----- 1
 - 1. Pronotum and crown marked with black and yellowish transverse fascia; face, at least in female, entirely or in part bright rufous ----- 2

1. Pronotum and crown without transverse fascia; mainly green and yellow above--- 3
 2. Pronotum with anterior margin broadly bright rufous; tegminae, with distinct black stripes along veins; one long outer antepical cell -----*Kolla fasciata* Walker
 2. Pronotum with anterior margin black; tegminae with narrow black lines along veins; one somewhat shorter outer antepical cell-----*Kolla carabela* Metcalf and Bruner
 3. Head about as wide as pronotum, crown somewhat pointed, bright yellow marked with regular geometrical design in narrow black lines; tegminae with only one claval vein distinct; clear grass green without markings; face largely black transversely striped above with pale yellow; anteclypeus of female below with prominent angle; antennae normal----- *Hortensia similis* Walker
 3. Head distinctly narrower than pronotum; crown much shorter and more obtuse than in foregoing, bright yellow marked with heavy, simpler design in black; ocelli placed in center of disc, relatively close together; tegminae with two claval veins distinct; green, marked along longitudinal veins with narrow black stripes; face largely pale without transverse bands, a black median spot above on clypeus, this very flat without angle below; antennae relatively long *Hortensia filicis* Metcalf and Bruner
- CC. Species not mainly green above----- 1
1. Above mainly black heavily marked with paler longitudinal stripes or blotches; below largely yellow; two subequal antepical cells; species of large or medium size ----- 2
 1. Above the greyish or fuscous brown, size small, less than 5 mm.----- 3
 2. Above black with pale, bright blue, irregular longitudinal markings on pronotum and tegminae; below deep yellow, face heavily marked with fuscous; size relatively large, length 8.75 mm-----
-----*Hadria balloui* Metcalf and Bruner.
 2. Above mainly black with slate grey variable stripes, sometimes washed along

- dorsum with yellow, orange or greenish yellow, below light yellow-----
Hadria convertibilis Metcalf and Bruner
2. Above mainly black with rows of numerous blue-grey elongated spots on tegminae; below yellow; face heavily marked with black, legs orange-brown; larger than foregoing, length 7-8 mm-----
Hadria convertibilis roigi Metcalf and Bruner.
 3. Crown and pronotum vittate with dark brown; radius branched no inner antepical cell -----
Entogonia inexpectata Metcalf and Bruner.
 3. Crown and pronotum not vittate; radius not branched, a larger inner antepical cell-----*Ciminus harti* Ball
- BB. Abdomen red or bright crimson above.
- C. Mainly yellowish or greyish white and pink, vittate with black or fuscous; three rather large antepical cells in tegminae 1
 1. Form elongate; crown horizontal, conspicuously sculptured; anteclypeus bent backward forming prominent angle near center; tegminae with the three antepical cells of about the same length; genital segment of female produced behind into point, without incision-----
Poeciloscarta cardini Metcalf and Bruner.
 1. Form relatively stout, crown gently sloping to face, nearly smooth; anteclypeus forming nearly even curve with clypeus, the inner antepical cell about twice as long as other two; genital segment of female with small notch at apex----- 2
 2. Head short and very broad; tegminae washed on lower surface with red and brown, usually no distinct yellow areas above except along costal margin; apex of genital segment with small shallow notch
Poeciloscarta laticeps Metcalf and Bruner
 2. Head usually slightly longer and narrower than above; tegminae on lower surface washed uniformly with red, above often marked with pale yellow especially on clavus, apex of genital segment with small u-shaped notch ----- 3
 3. Crown and pronotum buff striped with black, disc of latter on either side of

median pair of stripes often suffused with deep yellow or orange red; face with transverse black dashes between two vertical stripes on either side; legs buff, often more or less embrowned; apex of genital segment with narrow u-shaped notch; length 6.1 - 6.5 mm.---*Poeciloscarta histrio* Fabricius

3. Crown and pronotum paler, glossy, black stripes broader, usually continuous, disc of pronotum on either side of median pair of stripes deep orange red; face without transverse black dashes on either side; femora dull orange or red; apex of genital segment with u-shaped notch; size distinctly larger, length 6.5 - 7.5 mm.----*Poeciloscarta histrio* var. *baraguensis* Metcalf and Bruner

- CC. Not marked as above; two rather small antepical cells or none ----- 1
- 1, Distinctly vittate longitudinally with black or fuscous on crown and pronotum.----- 2
 1. Without distinct black vittae on crown and pronotum ----- 4
 2. Four broad black vittae on pronotum---- 3
 2. Five black vittae on pronotum, ground color of crown and thorax above orange yellow to greenish yellow; head somewhat pointed -----*Arezzia omaja* Metcalf and Bruner
 3. Above light blue and black: two broad black median vittae from apex of head to lateral angles of scutellum; black stripes on pronotum from behind eyes not percurrent; tegminae black with large, light blue, elongated blotches; head somewhat produced and distinctly pointed ----*Hortensia gundlachiana* Metcalf and Bruner
 3. Above mainly pink, vittate; two broad black median vittae from apex of head to lateral angles of scutellum, the latter with black median mark at base; black vittae on pronotum from behind eyes percurrent; tegminae pink and bluish grey marked with black along veins; head somewhat produced, rather narrowly rounded in front, but not distinctly pointed.-----*Hortensia conciliata* Metcalf and Bruner
 4. Crown and pronotum, at least anterior

- portion of latter, with vermiculate or labyrinthine markings; two small or very small anteapical cells ----- 5
4. Not so marked ----- 12
5. Tegminae and pronotum largely green--- 6
5. No green above ----- 10
6. The head, anterior margin of pronotum and scutellum yellow inscribed with black ----- 7
6. The head, anterior margin of pronotum and scutellum pale buff lightly inscribed with thin brown lines, the remainder of pronotum green heavily mottled with dark brown; tegminae green without markings; face buffy mottled with brown or the reverse, no black median spot above
Arezzia viridipennis Metcalf and Bruner
7. Size moderate, length 6.0 - 7.3 mm.----- 8
7. Size relatively large, length 7.7 - 9.0 mm.; head very short, broad and rounded anteriorly, heavily inscribed with black above in labyrinthine pattern, face strongly marked on sides with fuscous brown and with large irregular fuscous median spot above ----*Arezzia maestralis* Metcalf and Bruner
8. Face with dark median spot above; tegminae without distinct, white subapical transverse band ----- 9
8. Face without a dark median spot above; head somewhat produced and obtusely pointed, labyrinthine pattern above of numerous mostly anastomosing narrow black lines; tegminae with a distinct, milky white, subapical transverse band; below typically light lemon yellow-----
Hadria labyrinthica Metcalf and Bruner
9. General coloration above bright green, the black markings narrow; head short and broad, nearly rounded in front; face rounded in even curve to anteclypeus; genital segment of female moderately produced behind in center, the apex with shallow incision----- *Hadria cubana* Metcalf and Bruner
9. General coloration above dull greyish green, more heavily inscribed with black; head short but rather narrowly rounded in front; face with disc somewhat flattened; genital segment of female considerably produced behind into moderately acute

- point, with extreme apex obtuse; size larger, females exceeding 7mm.-----*Hadria trinitalis* Metcalf and Bruner
10. Crown short, broad and broadly rounded to face; face with a single median black spot above ----- 11
10. Crown triangular produced; face with a pair of black spots above -----*Lucumius triangularis* Metcalf and Bruner
11. Above mainly brown heavily marked with black; the black markings over either side of crown and pronotum forming a somewhat labyrinthine pattern of broken irregular stripes, arranged longitudinally; tegminae marked with black along veins; genital segment of female produced into point behind, the apex obtuse---*Arezzia rangeliana* Metcalf and Bruner
11. Above mainly brown, darker on head and anterior margin of pronotum, which are covered by network of very irregular somewhat vermiculate, buffy lines and spots almost as broad as intervening dark areas; arranged transversely on disc of pronotum; tegminae without black markings, irrogate with testaceous; genital segment of female produced behind into a long acute point, the apex with u-shaped notch----*Arezzia anachoreta* Metcalf and Bruner
12. Above pale purplish red marked with large deep orange maculae delimited by dark undulating lines; legs and venter stramineus----- *Hadria oteroi* Metcalf and Bruner
12. Above mainly dull wine red with few pale buffy markings on head and thorax, chiefly longitudinal, these for most part with broad indefinite fuscous borders; legs reddish, more or less infuscate-----
Arezzia baracoa Metcalf and Bruner

DRAECULACEPHALA BALL

(Ball 1901b: 66)

Orthotype *Tettigonia mollipes* Say 1830b: 312.

This is a genus of some 15 known species most of which come from the United States. One species *D. lenticula* Ball is

known only from Mexico and Honduras, and another species *D. minor* Walk. has been reported from the Southern States, Mexico, Guatemala and the West Indies. Most of the species resemble each other very closely having a rather acute triangular crown, usually longer than the pronotum. In the more northern species the crown is often broadly rounded. Face flat. Well developed wing venation with the apical area strongly reticulate. Most of the species are largely dull greenish in color with the crown, anterior margin of the pronotum and the scutellum dull yellow. Some of the species are straw yellow.

Ball (1927c) has recently reviewed the North American species and given a key for these forms. We cannot agree with his statement that the internal genitalia are not diagnostic. We believe that these furnish not only reliable specific but generic characters as well.

Draeculacephala cubana n. sp. Figs. 23, 48.

This species bears a superficial resemblance to the North American *mollipes*, but the crown of the female is longer and more acute and the male genitalia are entirely different.

The general color of the tegminae and the disc of the pronotum dark grass green. The crown and the anterior margin of the pronotum and scutellum straw yellow; crown faintly marked with a series of elongate brown dashes forming indistinct lines; ocelli and eyes conspicuously marked with black. Face fuscous, somewhat darker in the male and marked with a series of pale arcs; beneath dull yellow, more or less infuscated often completely infuscated in the male. Tegminae grass green, venation paler, sometimes blue, costal margin not abruptly paler, the claval furrow concolorous.

Crown of the male and female distinctly longer than the pronotum, acute in both sexes; lateral margins nearly straight. Face nearly straight in profile.

Last ventral segment of the female triangular, the lateral margins nearly straight; the pygofer rather robust. Male genitalia: Last ventral segment broadly circular in outline; plates elongate, longer than the pygofer.

Length: Female average 8.5 mm., male average 6.5 mm.

Holotype: Female, Santiago de las Vegas, April 20, 1916, S. C. Bruner.

Allotype: Male, same locality.

Paratypes: Numerous specimens. Santiago de las Vegas, Manzanillo, Havana, Casa Baragua, Miyanda, Carabella Grande, Sto. Tomás, Isla de Pinos, S. German, Buenos Aires.

CARNEOCEPHALA BALL

(Ball 1927c: 39)

Orthotype *Draeculacephala floridana* Ball 1901b:72.

In this genus the tegminae are reticulate apically but the crown is conically produced and the face is inflated. Seven species are known from the United States two of these are reported from Mexico and the West Indies also, and an eighth species is known from Central America.

Carneocephala reticulata Sign. Fig. 25

Tettigonia reticulata Signoret 1854a:22.

Originally described from Cuba as *Tettigonia reticulata* Signoret (1854a:22), the species has since been greatly confused in the literature, apparently due to the fact that the larger *Carneocephala flaviceps* Riley of continental North America was thought to be the same. The latter name is attached to the specimens in the Gundlach Museum in Havana (No. 284). Dr. P. Valdés Raqués (1910,) published a list of the insects in this museum transcribing the name as *flavipes* by mistake. It was reported as *Draeculacephala reticulata* by Bruner in 1922 and as *D. sagittifera* Uhler by Dr. Osborn in 1926. Nottingham (1932a:104) has recently pointed out that the latter while similar is not identical with the Cuban species. The genus *Carneocephala* was erected in 1927 by Ball for four species formerly included under *Draeculacephala*.

C. reticulata is widely distributed in Cuba and specimens have been taken in all of the provinces. It usually occurs on small grasses and is rather a common species. Dr. Osborn found it particularly on Bermuda grass (*Cynodon dactylon* (L.) Pers.).

Carneocephala flaviceps Riley. Fig. 24.

Tettigonia flaviceps Riley 1880a:78.

This species is common throughout the Southern States. A single female specimen was taken at Santiago de las Vegas without further data.

HORTENSIA GEN. N.

Orthotype *Tettigonia similis* Walker 1851b:769.

Head including the eyes somewhat narrower than pronotum, somewhat conically produced; eyes not prominent; crown smooth. Pronotum distinctly broader than long; the anterior margin nearly a uniform curve from the posterior humeral angles; posterior margin nearly straight. Mesonotum large. Tegminae narrow with three large anteapical cells. Aedeagus simple with a pair of short lobe-like processes at the base of the apical lobe.

Hortensia filicis n. sp. Figs. 2, 26.

A rather small species with head obtusely angular and somewhat narrower than pronotum; bright green and yellow, the vertex heavily marked with black, veins of tegminae narrowly black and abdomen fuscous above.

Head rather short; crown obtusely angular, sides slightly rounded, more so in male, about one and one-half times as broad as long, slightly more than half the length of pronotum, shorter in male; eyes not prominent in line with crown; ocelli in center of disc, nearer together than usual in *Cicadella*; antennae rather long, segment two elongate, apex visible from above; face with disc very flat, almost perfectly straight in profile, forming angle of 70-75 degrees with vertex; very broadly and nearly evenly curved from anteclypeus to apex, slightly prominent near center. Pronotum about one-tenth broader than head across eyes, nearly six-tenths as long as broad, surface smooth, a shallow depression behind anterior margin, posterior margin nearly straight. Tegminae with three relatively large oblong anteapical cells, the inner shorter; venation resembling that of *H. similis* Walk. except for presence of two veins.

Genitalia: Female, last ventral segment somewhat more than twice as long as preceding, posterior margin angularly produced, surmounted by a short rather acute median tooth; pygofer with pale or brownish bristles, mostly on sides behind

ventral margin. Male last ventral segment nearly twice as broad as long, about a third longer than preceding, posterior margin nearly straight or slightly convex; plates rather small and broad basally, apices long and relatively thick, exterior margins with regular row of long pale bristles. Valve very small, posterior margin circular, frequently entirely concealed by the last ventral segment.

Color: Crown shining yellow marked with heavy regular design in black, about equal in extent to yellow, including an area on either side of apex, a patch on either side of disc from and including ocelli to or near posterior margin, an inverted V-shaped median mark from base to beyond level of ocelli; black markings usually connected with each other. Pronotum largely bright green with anterior and lateral margins for about one-fourth of length irregularly yellow, posterior margin very narrowly yellow, a small, roughly oval, oblique black spot on either side of disc at anterior border of green area and a similar smaller spot in front of each in yellow area sometimes connected or obsolete; a small, usually elongated black mark from behind posterior angle of eyes. Scutellum yellow, a black vitta on each side of center from base to deep transverse suture, where apices are more or less prolonged inwards; postscutellum somewhat paler. Tegminae bright green marked over longitudinal veins with narrow, even, black stripes; transverse veins and short indefinite band behind outer apical margin opaque whitish; apical area with inner half to apex of clavus subhyaline, pale fuscous. Below largely pale buffy yellow marked with black and fuscous brown. Face with elongate oval central area from crown nearly to anteclypeus usually more distinctly yellow, a large rounded median black spot above near margin, black of crown continued on either side of this, fading gradually below to form an indefinite pale brown band on sides, converging to base of anteclypeus; thence continued as broad paler median band; darker, narrow, oblique stripes at times faintly indicated in brown on sides of face with a fuscous black stripe along inner margin; an irregular dark patch on genae beneath eyes. Pronotum with large fuscous patch on sides behind eyes. Mesosternum largely fuscous. Legs and rostrum pale, basal joints of latter externally and claws somewhat embrowned. Venter of female, including ovipositor, pale buffy yellow; apical tooth on genital segment slightly darker; venter of male usually infuscate, except plates

which are usually much paler. Abdomen above fuscous. Wings infuscated.

Length: 5.5 - 6 mm.

Holotype: Female, Palma Mocha Peak, Sierra Maestra Mts., Oriente Province, altitude 3,000—4,250 ft., July 10 - 20, 1922, C. H. Ballou and S. C. Bruner; on ferns (E. E. A. de Cuba No. 8896).

Allotype: Male, Sierra Maestra Mts., altitude 3,500 - 4,500 ft.

Paratypes: Eleven specimens, same data as types. One female, Pico Turquino, July 20, 1922, S. C. Bruner and C. H. Ballou, altitude 5,000 — 5,500 ft.

This species is strikingly different structurally from all other species found in Cuba. The venation of tegminae is very similar to that of *H. similis* Walk. The insect was swept from ferns growing along shady, steep-banked, mountain brooks.

Hortensia similis Walk. Figs. 1, 31, 49.

Tettigonia similis Walker 1851b: 769

This widely distributed species was described from North America, has been reported from Florida, Cuba, Jamaica, St. Vincent, Trinidad, Puerto Rico, Dominica, Mexico, Central America, Venezuela, Brazil, and Argentina; and occurs abundantly on grasses throughout Cuba, specimens having been collected in many localities in all provinces including the Trinidad Mountains up to at least 2,500 ft., and on the Zapata Peninsula.

It differs from the other species of Cuban *Cicadellidae* in having only one claval vein conspicuous and by the peculiar form of the clypeus of the females, this being directed abruptly backward, a short distance before the anteclypeus, thus forming a conspicuous obtuse angle in lateral view. In the males this is barely indicated. There is considerable variation in size, Cuban specimens measuring 4 — 6 mm. in length, the males being much the smaller.

Hortensia gundlachiana n. sp. Fig. 5.

Readily distinguishable from other species occurring in Cuba by the very striking coloration of light blue, yellowish green and black; and by the well produced, narrow, pointed head.

Head considerably produced before eyes with the apex pointed, the sides somewhat arcuate, more so in the female;

tri and S. C. Bruner, and Baracoa, S. C. Bruner and L. Boucla, Oriente Province. Male, Jaronu, L. C. Scaramuzza, two females Alguizar Havana, L. C. Scaramuzza, four females, Buenos Aires, Trinidad Mts., S. C. Bruner and A. R. Otero.

This species manifests a perplexing number of what are evidently local color varieties for no definite structural differences have been discovered by which they can be separated. We have selected as the type the insect occurring in the Sierra Rangel Mountains of Western Cuba. This is rather uniform in coloration above, but below may vary from almost entirely pale yellow to fuscous brown with perhaps only the venter dusky yellow. Lowland specimens from Santiago de las Vegas are brighter colored, bluish grey and black above with apex of clavus pale and largely bright yellow below. From the Zapata Swamp and Nagua, Oriente, the pale stripes are broader, often paler and those on clavus more or less suffused with orange yellow, deeper along commissural margins. The face, furthermore, is often heavily marked with black; a broad dark band on either side of disc extending downward to disc of clypeus, usually broken above by transverse pale stripes, a black band from insertion of antennae connecting with former above sides of clypeus, and another shorter streak from below eyes. The black median spot on face may also be continued downward as band. In some specimens from Santiago de Cuba the pale areas above are still broader and those on head and pronotum as well as on tegminae largely yellow or olive yellow.

Pedro Valdés Ragués (1910 a) published Uhler's manuscript name, "*Tettigonia convertibilis*" giving the following abbreviated description "5 mm. dark red, No. 76". There are several specimens numbered 76 in the Gundlach Museum among which the present form is certainly included, but more than one species may be represented. Those who adhere to a very strict interpretation of the International Rules may prefer to credit this species to Valdés.

Hadria convertibilis var. *roigi* var. n. Fig. 32.

Similar to *H. convertibilis* but may be distinguished by larger size, stronger black markings on face, and a tendency of the paler stripes on tegminae to break up into rows of spots and dashes.

Genitalia: Female, similar to *H. convertibilis*.

Color: Above largely black with markings similar in arrangement and general appearance to those of typical *H. convertibilis*, but paler longitudinal stripes on tegminae on four of the five specimens are entirely broken up into numerous irregular spots and dashes. This color and corresponding markings on pronotum are largely dark bluish grey with no indication of yellow. The pale markings on head, anterior and lateral margins of pronotum, scutellum and commissural margins of tegminae are greyish white. Below resembling strongly marked forms of *convertibilis* from eastern Cuba. Face pale grey washed with yellowish on sides and clypeus heavily marked with black as follows: A large indefinite median fuscous spot above on face, sometimes extended below towards center, a broad vertical black band on either side extending to anteclypeus, often more or less broken above by pale transverse stripes, sides from antennae to anteclypeus broadly black, the latter with base and disc also largely black; genae with elongated black macula from eyes to lorae; and sometimes a smaller spot over apical half of lorae. Legs bright orange brown, often darker apically. Venter deep yellow, the sternal sclerites with disc more or less fuscous, more broadly so towards base.

Length: 7 - 8 mm.

Holotype: Female, Buenos Aires, Trinidad Mts., Santa Clara Prov., elevation 2,350 - 2,800 ft., S. C. Bruner and A. R. Otero.

Allotype: Male, same locality.

Paratypes: Four females, same data.

Hadria balloui n. sp. Figs. 16, 37.

A relatively large, rather elongate species, largely black above marked with blue and greyish white, with dorsum of abdomen fuscous; related to *H. convertibilis* but readily distinguishable by much greater size, distinctly blue markings and characters of external and internal genitalia.

Head short and obtuse, crown nearly evenly rounded in front, disc somewhat flattened, in female about two and one-half times as broad as long, one-half length of pronotum; eyes relatively small slightly protruding; antennae rather short; face normal; anteclypeus in plane with face to near center, then bent upward forming rounded obtuse angle, more prominent than in *convertibilis*. Pronotum subequal in width to head across eyes,

nearly twice as broad as long, posterior four-fifths shallowly transversally striate, posterior margin nearly straight, very slightly concave. Tegminae of usual form, apex evenly rounded, two moderately large, subequal, oblong, nearly rectangular antepical cells.

Genitalia: Female, last ventral segment about two and three-fourth times as long as preceding, posterior margin produced into a strong acute tooth; pygofers rather thickly and uniformly covered with brownish yellow bristles. Male, last ventral segment about one-half broader than long, one-third longer than preceding segment, posterior margin nearly straight; valve broad and short posterior margin broadly curved. Plates rather large and stout, gradually curved inwards towards apices, which are short, very obtuse, and overlap, extending behind nearly to apex of pygofers, exterior margins with regular row of deep yellow bristles of moderate length.

Color: Crown largely black with a few small greyish or slightly yellowish markings as follows: Two minute median spots followed by two longitudinal, slightly divergent, short stripes to posterior margin, and few irregular spots between ocelli and eyes. Pronotum largely black, the anterior margin with two median rounded greyish white spots, followed by two irregular parallel dull or bright cobalt blue bands over disc to posterior margin; a narrower sinuate longitudinal band from anterior margin behind center of eye, nearly evanescent before hind margin, and lateral margins largely greyish white; the intermediate pale stripe with few pale spots on inner side of anterior margin followed by irregular broken blue border. Scutellum black with a broken ring-like yellowish or greyish white mark at base on either side of center and a similar heart-shaped mark, sometimes divided in center, at apex; postscutellum yellowish white. Tegminae black with deep cobalt blue, irregular, elongated variable areas over clavus and corium; apex of clavus and broken stripe along commissural margins paler; a short, irregular preapical yellowish white transverse band from near costal margin, usually reaching apex of first antepical cell. Below largely deep yellow. Face pale buffy yellow heavily marked with fuscous as follows: Face with a very large irregular fuscous median spot above, a series of about seven fuscous brown, more or less broken, oblique, parallel arcs on sides, a very large central macula, covering larger part of apex

and continued over basal half of disc of anteclypeus. Mesosternum largely fuscous. Legs and rostrum more or less embrowned posterior femora paler. Apical tooth of female genital segment brown. Abdomen above fuscous. Wings infusate with darker veins.

Length: 8.75 mm.

Holotype: Female, summit of Turquino Peak, Sierra Maestra Mts., Oriente Prov., altitude 6,600 ft., July 20, 1922, C. H. Ballou and S. C. Bruner, (E. E. A. de Cuba No. 8886).

Allotype: Male, same data.

Paratypes: Four specimens, same data, at altitudes between 3,600 and 6,000 ft.

The peculiar male genitalia distinguish this species from all others studied from Cuba.

Hadria oteroi n. sp. Fig. 18.

Immediately distinguishable from all known Cuban species by the brilliant coloration: Above opaque rosy red marked on head, thorax and tegminae with rich yellow and orange, the maculae sharply defined and bordered with very dark red, or fusco-piceous.

Head short, obtusely angular, well rounded in front, crown about as long as one-half width, somewhat more than one-half as long as pronotum. Eyes not prominent, forming continuous even curve with crown; rather strongly sinuate below on posterior margin. Pronotum nearly as broad as head. Tegminae of usual form.

Genitalia: Female, last ventral segment about four times as long as preceding, considerably produced behind into a moderately acute angle, the apex rounded and provided with a very small angular median tooth; pygofer with few short bristles, mostly pale.

Color: Crown light orange yellow with dark brownish red markings as follows: An irregular transverse subapical line and a broader uneven basal line from inner angle of each eye, these transverse lines connected by a narrow median line. Pronotum with disc covered by a large deep yellow macula, broadly three lobed in front and nearly truncate with median incision behind, surrounded by a dark purplish red irregular border, this darker anteriorly from which project a number of irregular vermiculate

lines, the remainder of anterior portion of pronotum pale grey, as is adjoining narrow central portion of hind margin of head; the pronotum behind macula is rosy red, an indefinite orange spot on lateral margins behind eyes. Scutellum largely yellow, an oblique band across each lateral angle and a small central mark at base dark brownish red; postscutellum brownish pink. Tegminae dull rosy red with deep yellow markings, these broadly but irregularly bordered with very dark or smoky red, as follows: a somewhat rounded spot on clavus near anterior angle, next to suture, a large more distinct rounded macula over center of clavus of both tegminae bisected by commissural line, the apex of clavus for about length of central macula, a rather small ovoid macula somewhat before center of corium, and a large transverse patch just behind apex of clavus, divided by two dark longitudinal veins, these latter markings indefinite in paratype. Behind this there is a small dark orange red, broadly oval, transverse subapical macula, the veins through which are red and inconspicuous. The apical margin and subhyaline apical area are infuscated. The longitudinal veins, except at apex, are broadly very dark red. The costal area behind margin is narrowly washed with yellow. Below, face orange red, paler on disc of clypeus above; clypeus marked with fuscous as follows: a median stripe from base to beyond center, two irregular lines on each side converging at an acute angle below apex, these crossed and more or less broken by about nine oblique parallel pale yellow bars. Apex of clypeus at sides and adjoining base of disc of anteclypeus infuscated as is also the central portion of latter to sides, the apex pale. The lorae and genae largely infuscate. Remainder of under parts including legs pale stramineous except pro- and mesosterni and pleurae which are largely infuscate. The ventral segments laterally and apex and posterior lateral angles of genital segment and basal half of pygofer are washed with fuscous, the remainder of latter with red. The abdomen above is bright crimson. Wings infuscate with darker veins. The single paratype is paler below, without fuscous or red on venter, and the dark markings above are nearly black and yellow areas are orange red.

Length: 7.0 mm.

Holotype: Female, Buenos Aires, Trinidad Mts., Santa Clara Province, elevation 2,350 - 2,800 ft., May 4, 1932, A. R. Otero and S. C. Bruner, on *Coffea arabica*; (E. E. A. de Cuba No. 10,000).

Paratype: Female, Las Animas, Sierra Rangel, Pinar del Río Province, elevation 1,500 ft., April 27, 1933, A. R. Otero and S. C. Bruner, on tree fern (*Alsophila*).

Hadria trinitalis n. sp. Figs. 10, 45.

Very similiar to *Arezzia cubana* but distinguishable by larger size, duller, rather greyish green color, more coarsely and thickly inscribed and striped with black, above, and very different female genitalia.

Vertex moderately produced as in *cubana*, slightly more pointed, somewhat longer than one-half basal width, scarcely three-fifths as long as pronotum. Face with disc flattened. Pronotum as broad as head across eyes. Tegminae rather narrow, narrower than in *cubana*, provided with two short antepical cells.

Genitalia: Female, last ventral segment, about four times as long as preceding, considerably produced caudad into moderately acute point, rounded at extreme apex; pygofer with few brown bristles. Male, last ventral segment somewhat longer than wide basally, about one and two-thirds as long as preceding, posterior margin nearly straight, plates broad basally tapering to acute apices, slightly curved upwards, not reaching apex of pygofer; sides with a row of closely set brown bristles, a few pale coarse hairs behind.

Color: Above dull greyish or somewhat brownish green and light olive yellow strongly marked with irregular black vermiculate design and longitudinal stripes. Crown usually yellow, often more or less brownish, covered with black variable design of broad irregular vermiculate lines. Pronotum with anterior border to and including posterior lateral angles broadly light olive yellow, the remainder green, concolorous with tegminae, the surface marked with heavy irregular black dashes and lines, tending to form longitudinal stripes; two regular parallel stripes on center of disc and another from behind center of each eye often more or less continuous; black markings on anterior yellow border usually vermiculate and anastomosing. Scutellum light olive yellow with regular design in heavy black uneven lines; postscutellum pale yellow, not white and sharply contrasting with scutellum as in *A. cubana*. Tegminae dull green, often somewhat greyish or brownish, the anterior costal area washed with light olive yellow, and whole surface marked with heavy black longitudinal lines, on and between veins, the

latter tending to be wavy and often more or less broken or incomplete cephalad; the veins surrounding the short anteapical cells are black, more or less distinctly lined with pale on anterior side; whole appendix semitransparent, deep smoky; extreme apex of clavus pale. Below creamy buff lightly washed with brownish olive on sides of head and pleurae. Disc of face at level of insertion of antennae with an angular black or fuscous median spot, immediately around which the disc is pale, then washed with brown, each side with eight or more darker brown but indefinite oblique stripes which extend more or less on paler sides; anteclypeus embrowned basally on disc and often along narrow median ridge to apex. Mesosternum with fuscous patch on sides. Legs with tibiae and tarsi more or less washed with brown, especially anterior pair, often also including an indefinite pale brown anteapical band on anterior and intermediate femora. Apex of genital segment of female slightly embrowned. Abdomen above bright crimson. Wings infusate with black veins.

Length: 6.4 — 7.3 mm.

Holotype: Female and Allotype: Male, Buenos Aires, Trinidad Mts., Santa Clara Province, altitude 2,350 — 2,800 ft., May 4, 1932, S. C. Bruner and A. R. Otero, on *Coffea arabica*.

Paratypes: Ten specimens, same data.

Adults were very numerous on coffee plants and more or less shrubby growth of surrounding native hardwoods. It is a species peculiar to the Trinidad mountain region.

Hadria labyrinthica n. sp. Figs. 15, 40.

Above green and greenish yellow, rather heavily inscribed with black, the head, pronotum in part, and scutellum with an intricate network of irregular black lines; closely resembling *Arezzia cubana* but distinguishable by clear yellow ground color of clypeus with neither dark median spot above nor brownish wash over disc, the presence of a distinct milky white subapical transverse band on tegminae and shape of genital segment.

Head obtusely triangular with apex well rounded, length of crown rather variable, shorter in male, usually somewhat more than one-half as long as basal width, nearly two-thirds as long as pronotum. Pronotum subequal in width to head. Tegminae moderately broad, narrower apically than in *A. cubana*,

provided with two small subquadrate anteapical cells, nearly equal in length.

Genitalia: Female, last ventral segment long, about three times as long as preceding, posterior margin somewhat angularly produced in center, apex rather broad, distinctly bisinuate, with a small obtusely angular median tooth; pygofers with few short, coarse, brown bristles. Male, last ventral segment transverse, somewhat longer than preceding, posterior margin straight; plates broad basally tapering suddenly to narrow upturned points, almost attaining apex of short pygofers.

Color: Above, crown yellow or greenish yellow covered with a more or less symmetrical and variable design of numerous irregular, curved, partly anastomosing distinct black lines. Pronotum with anterior and lateral margins for about one-fourth length yellow, concolorous with head, and inscribed with similar black lines; remainder green, the whole surface marked with irregular black spots and transverse dashes. Scutellum yellow, concolorous with head, covered with more or less irregular design of distinct curved black lines, forming a cross in center; postscutellum ivory white. Tegminae green, the costal region anteriorly washed with yellow, the longitudinal veins to dark apical area marked with continuous black lines between which is an indefinite row of very irregular spots and curved dashes; apex of tegminae infuscated with paler yellowish brown veins and divided anteriorly by a conspicuous opaque white transverse band from costal margin to oblique subhyaline area which is also infuscated; the extreme apex of clavus washed with milky white. Below usually pale lemon yellow more intense on head towards front, legs pale stramineous, the tarsi and apex of tibiae often darker, clypeus marked with scattered irregular black or fuscous spots, more numerous above, sometimes forming indefinite parallel oblique stripes on sides, no median dark spot on disc; usually a dark patch on margin between face and crown before level of insertion of antennae. Pronotum with black spot on side immediately behind eye. Mesosternum usually dark, the apex of genital segment of female embrowned. Abdomen above bright crimson. Wings infuscated with darker veins. Entire insect sometimes more or less infuscated so that yellow is obscured and green very dark.

Length: 6.0—6.5 mm.

Holotype: Female, and Allotype: Male, San Blas, Trinidad Mts., Santa Clara Province, May 5, 1932, S. C. Bruner and A. R. Otero, (E. E. A. de Cuba No. 10039).

Paratypes: Buenos Aires, Trinidad Mts., elevation 2,350—2,800 ft., S. C. Bruner, A. R. Otero; Central Soledad, Cienfuegos, S. C. Bruner, A. R. Otero; and Santiago de Cuba, S. C. Bruner, Baracoa, S. C. Bruner and L. Bouclé, Nagua (E. E. A. de Cuba No. 8887), C. H. Ballou, S. C. Bruner, Jarahueca, S. C. Bruner, Maisi, J. Acuña, Loma del Gato, all in Oriente Province; Sierra Rangel, Pinar del Río Prov., J. Acuña and A. R. Otero.

This is the common green woodland Cicadella of Oriente Province, where it apparently entirely replaces the very similar *A. cubana*, with which it may, however, be found in central and western Cuba.

Hadria cubana n. sp. Figs. 13, 38.

In general coloration resembling *H. similis* Walk. but larger and more robust, with a much shorter, more rounded, and broader head; more densely inscribed with black on crown, pronotum and scutellum; tegminae also marked with longitudinal black dashes or lines and abdomen red above.

Crown moderately produced, apex broadly rounded; somewhat longer than one-half basal width, nearly three-fifths length of pronotum; shorter in male. Pronotum scarcely as broad as head across eyes. Tegminae rather broad, provided normally with two short anteapical cells.

Genitalia: Female, last ventral segment long, more than four times as long as preceding; moderately produced behind in center and apex with distinct somewhat rectangular or rounded notch, this usually about twice as wide as deep and sometimes with a small tooth at bottom; pygofer with few short pale brownish bristles. Male, last ventral segment transverse, rectangular, longer than preceding, posterior margin slightly convex, plates broad basally, tapered into long, narrow recurved points.

Color: Above largely green marked with greenish yellow and inscribed with black. Crown yellow covered with black design of narrow vermiculate lines, these somewhat variable and sometimes broken into spots and curved dashes, a narrow median straight line reaching forward from base to center or

beyond. Pronotum with anterior margin broadly yellow to posterior lateral angles, remainder green, the whole surface marked with black vermiculate dashes and spots, mostly arranged transversely, those on anterior yellow portion tending to form continuous lines. Scutellum yellow marked with irregular design of black lines as shown in figure; postscutellum ivory white. Tegminae green, the costal region anteriorly washed with yellow, the longitudinal veins marked with narrow dark fuscous lines between which is a more or less indistinct broken irregular fuscous line; the veins surrounding the short antepical cells usually largely opaque yellow, appendix subhyaline, lightly infusate, apical margin darker before which are two or three indefinite small opaque whitish patches; the inner margin behind apex of clavus with a small black dash preceded and followed by minute milky white patches. Below light ochraceous buff, the head anteriorly and meso- and metapleura more or less suffused with yellow, the clypeus at level of insertion of antennae with a small variable, angular median spot, around which it is usually lightly washed with brown and marked on sides with some ten more or less distinct light fuscous arcs; the base of anteclypeus also washed with light fuscous; mandibular sclerites black next the anteclypeal border; the mesosternum with a large fuscous patch on either side; the apex of genital segment of female embrowned; abdomen above bright scarlet red. Wings infusate.

Length: 6.0—6.75 mm.

Holotype: Female, and Allotype: Male, Santiago de las Vegas, Havana, May 16, 1932, A. R. Otero.

Paratypes: Sierra Rangel, near Taco-Taco, Pinar de Río, J. Acuña, C. H. Ballou, S. C. Bruner, A. R. Otero, (E. E. A. de Cuba No. 8738); Santiago de las Vegas, Havana, A. R. Otero; Pan de Matanzas Mt., Matanzas Prov., L. C. Scaramuzza, S. C. Bruner, A. R. Otero, (E. E. A. de Cuba No. 10010); Cayo Ramona, Ciénaga de Zapata, S. C. Bruner, (E. E. A. de Cuba No. 8544); Barrio Caobillas, Camagüey Province, J. Acuña, Bainoa, S. C. Bruner, Nagua, Oriente Province, S. C. Bruner, Sto. Tomás, Zapata Prov., S. C. Bruner, Valle San Guan, Bahía, Honda, S. C. Bruner.

Although one of the commonest woodland species throughout a large part of Cuba no description has apparently been publish-

ed. Adults occur on the shrubby growth of "guara" (*Cupania cubensis*) and various other small hardwoods. Specimens from the more humid and dense hill-side localities are of a darker green color. The form of the notch on the apex of female genital segment varies considerably.

Arezzia gen. n.

Orthotype *Arezzia maestralis* n. sp.

This genus may be recognized by the peculiar venation and internal male genitalia.

Head about as broad as pronotum, not produced; crown much broader than long; face not inflated. Pronotum broader than long, anterior angles not produced, anterior margin broadly rounded. Scutellum large, broader than long. Tegminae coriaceous; membrane broad; main veins unbranched; two small nearly quadrate anteapical cells. Anterior and posterior tibiae ciliate. Male aedeagus with an elongate assymmetrical process.

Arezzia maestralis n. sp. Figs. 12, 41, 55.

A relatively large, robust, green and yellow species finely marked with black, somewhat resembling *Hadria cubana* n. sp. in coloration but immediately distinguishable by much larger size, broader, much shorter and more obtuse head, transverse wrinkles on pronotum and conspicuously angular anteclypeus.

Head short, thick, slightly broader than pronotum; crown nearly evenly rounded in front, slightly longer on median line, about two and one-half times as broad as long, slightly shorter and more obtuse in male, about half the length of pronotum; eyes not prominent, normal, forming nearly even curve with crown; clypeus considerably flattened, disc slightly convex in lateral view, forming nearly a right angle with crown; anteclypeus continued in same plane as clypeus to center, then bent upward at a very obtuse but conspicuous angle of almost 140 degrees. Pronotum nearly as wide as head, almost twice as broad as long, posterior margin distinctly concave, surface, except anterior yellow portion with very shallow transverse wrinkles. Tegminae rather broad, slightly narrower apically, apex evenly rounded, with two small roundish anteapical cells of about the same size.

Genitalia: Female, last ventral segment about three times as long as preceding, posterior margin moderately and evenly produced in center, apex with a small broad usually rounded

notch on either side of a small short tooth, somewhat variable in length; pygofer along exposed ventral margin subequal in length to last ventral segment, with few stout brownish bristles. Male, last ventral segment about seven-tenths as long as broad, nearly one-fourth longer than preceding segment, posterior margin straight; plates of usual form, slender apices extending nearly to apex of pygofer, stout marginal bristles rather long, pale or brownish, intermixed with few much longer pale hairs.

Color: Above, crown dull yellow marked with intricate, more or less anastomosing, somewhat variable, labyrinth-form pattern in rather thick black lines. Pronotum largely dull green, the anterior and lateral margins broadly yellow, the whole surface marked with dark vermiculate black spots and dashes, these appearing darker and more or less anastomosing on anterior pale margin, similar to those on crown; a small irregular macula behind exterior half of eyes. Scutellum dull yellow or greenish yellow, marked with more or less regular but variable design in uneven black lines, a rough cross over center constant; postscutellum concolorous or slightly paler. Tegminae dull green marked along longitudinal veins to apical transverse veins with black line and between these with wavy broken lines and dashes; apical aerea pale translucent fuscous, the green bordering this usually yellowish, but no distinct transverse pale anteapical macula; veins of apex of tegminae yellow-brown. Below largely pale yellow, more intense on face and pleurae, with dark markings as follows: Clypeus with an irregular, variable, usually rather large fuscous black median spot above and nine or ten oblique, parallel, often unbroken, strong, fuscous brown bars on sides which do not extend below to anteclypeus, the disc sometimes brownish; a small, irregular, fuscous spot on genae beneath eyes and sometimes a smaller more or less distinct mark on disc of anteclypeus; first segment of rostrum often infusate externally; one or two small indefinite fuscous maculae on sides. Legs with tibiae and tarsi usually buffy or brownish, the posterior femora more or less infusate apically in front. Apex of genital segment of female slightly embrowned. Abdomen above bright crimson. Wings infusate with dark veins.

Length: 7.7 - 9.0 mm.

Holotype: Female, and Allotype: Male, Turquino Peak, Sierra Maestra Mts., Oriente Province, altitude 5,000 — 5,500

ft., July 20, 1922, S. C. Bruner and C. H. Ballou, (E. E. A. de Cuba No. 8890).

Paratypes: Twenty specimens, same locality, from the summit of Turquino Peak, Palma Mocha Peak, and other points in the Sierra Maestra, altitudes 4,000—6,600 ft., C. H. Ballou and S. C. Bruner.

This species and *Hadria balloui* are of the same length and are the largest members of the Cicadellinae so far known from Cuba. It was the most abundant Cicadellid found in the Sierra Maestra on the Turquino expedition.

The shallow transverse wrinkles or corrugations on the pronotum are very weak. These and form of the clypeus suggest characters of generic significance; however, the insect is clearly closely related to other species of *Arezzia* and cannot be satisfactorily separated generically.

Arezzia omaja n. sp. Figs. 17, 39.

A rather small species with relatively narrow pointed head; deep yellow and green conspicuously striped with black; abdomen red above.

Head moderately produced, slightly flattened, rather distinctly angled, about three-fifths as long as broad, shorter and more obtuse in male, nearly four-fifths as long as pronotum. Face with disc flattened, surface nearly straight in lateral view, forming angle of about 70 degrees with crown. Anteclypeus normal, slightly prominent in center. Pronotum as broad or slightly broader than head, a gentle transverse depression across median line, behind anterior margin. Tegminae somewhat narrow, apex broadly rounded, two subequal, nearly rectangular antepical cells of moderate size, about twice as long as broad.

Genitalia: Female, last ventral segment large, about two and one-half times as long as preceding, central area considerably produced with small angular notch on each side of small acute median tooth; pygofers with few brownish bristles. Male, last ventral segment somewhat transverse, posterior margin straight about one-third longer than preceding, plates rather short and broad basally, the narrow recurved apices extending nearly to apex of pygofers, sides with rather long pale bristles and hairs.

Color: Crown, pronotum and scutellum largely greenish yellow or light orange yellow heavily striped with black as follows: Crown with a narrow black median line from base to

near apex, a broad black percurrent longitudinal band with undulating margins on either side from which, anterior to center, a narrow fork runs obliquely backward through ocelli to inner angle of eyes; a narrow black dash on sides of crown from anterior margin of eyes; the narrow median line and broad lateral stripes of crown continued on pronotum to posterior margin, a broad, nearly percurrent stripe from behind each eye; the ground color over disc to posterior margin washed with greenish; scutellum with median stripe of pronotum continued over basal half to dark transverse suture and intermediate stripes continued, gradually narrowed, to either side of apex; postscutellum yellowish. Tegminae with ground color largely green washed with orange yellow along commissural margins, the longitudinal veins marked by rather even black stripes, apical area including anteapical cells fuscous with a conspicuous yellowish white transverse macula rounded behind, extending from costal margin near apical cross veins to fourth apical cell; the costal region anteriorly washed with opaque pale yellow, ground color bordering orange yellow of commissural region, sometimes more or less bluish. Below buff with face and sides washed with yellow and marked with fuscous brown as follows: Clypeus with a conspicuous median spot above near apex and usually two to four incomplete, variable oblique dashes on sides which merge into a solid band below forming arms of large variable, roughly Y-shaped mark, the stalk of which is formed by a broad median band on anteclypeus; small markings on cheeks below eyes and indefinite larger maculae on pleurae; ventral sclerites largely fuscous brown in females and only slightly so in males; the last ventral segment of female has disc and posterior margins fuscous brown. Abdomen above bright crimson. Wings infusate with darker veins.

Length: 5.3 — 5.9 mm.

Holotype: Female, San Blas, Trinidad Mts., Santa Clara Province, May 5, 1932, S. C. Bruner and A. R. Otero.

Allotype: Male, El Cobre, Oriente Province, October 5, 1928, F. Silvestri and S. C. Bruner, (E. E. A. de Cuba No. 10,037).

Paratypes: Two specimens, San Blas, Trinidad Mts., S. C. Bruner and A. R. Otero; Cumanayagua, Santa Clara, F. de Zayas. One male Nagua, Oriente Province, July 7, 1922, S. C.

Bruner and C. H. Ballou. A pair, Omaja, July 24, S. C. Bruner, one male, Camagüey, July 30, J. Acuña.

Arezzia anachoreta n. sp. Figs. 19, 42.

A rather large stout species with short, rounded head, buffy heavily marked with dark brown vermiculate lines and spots; abdomen red above.

Head short, broadly rounded in front, crown distinctly shorter than one-half basal width, about one-half as long as pronotum. Face moderately convex, disc somewhat flattened. Pronotum slightly narrower than head. Tegminae moderately broad with two small short antepical cells.

Genitalia: Female, last ventral segment about four times as long as the preceding, considerably produced behind, sides converging concavely to acute point, the apex with a distinct U-shaped notch, thus forming two small very sharp points; pygofers with very few scattered short bristles. Male, last ventral segment nearly as long as broad, about one-third longer than the preceding, posterior margin straight; plates broad and short with apices not appreciably elongated, distinctly shorter than pygofers, pale buff with usual row of fuscous bristles.

Color: Crown pale yellow partly stained with salmon pink and heavily inscribed with fuscous design of irregular anastomosing, somewhat vermiculate lines about as broad as remaining pale areas. Pronotum pale yellow, the anterior one-third heavily marked with broad, irregular, vermiculate anastomosing fuscous lines; the remainder largely dark brown the surface marked with numerous irregular yellowish white spots or blotches mostly arranged transversely; the narrow lateral and posterior margins also yellowish white. Scutellum pale yellow more or less stained with salmon pink and covered with a rather regular design of heavy uneven fuscous brown lines; postscutellum entirely yellowish white, contrasting sharply with scutellum. Tegminae light brown irrorate with pale testaceous; extreme apex of clavus greyish white; a very faint incomplete subapical transverse fascia across base of apical cells; the subhyaline apical area nearly concolorous with rest of tegminae. Below largely pale buffy yellow, slightly stained with pinkish in places and marked with fuscous brown as follows: Clypeus with a large irregular median fuscous spot on disc above and about nine distinct fuscous-brown parallel oblique lines on sides; the

disc also lightly washed with brown except around median spot. Sternum largely infusate. Legs with a faint anteapical band on femora; tibiae and tarsi lightly infusate, the claws darker. Venter pale yellow, the pygofer somewhat pinkish, the notch at apex of genital segment embrowned. Abdomen above bright crimson. Wings pale fuscous with darker veins.

Length: 6.50 - 7.75 mm.

Holotype: Female, Buenos Aires, Trinidad Mts., Santa Clara Province, elevation 2,350 - 2,800 ft., May 3, 1932, J. Acuña, (E. E. A. de Cuba No. 10036.)

Allotype: Male, Las Animas, Sierra Rangel, Pinar del Río Province, elevation 1,500 ft., April 28, 1933, S. C. Bruner and A. R. Otero.

Paratypes: Eleven male specimens taken with the allotype, one pair from Camagüey, July 15, 1921, J. Acuña, (E. E. A. de Cuba No. 8689), and one female from Las Animas, Sierra Rangel, May 1933, Hermano Roberto. One male, same data as above. One female, Nagua, Oriente Prov., July 7, 1922, S. C. Bruner and C. H. Ballou. One male, San Nicolas, Ote, July 21, 1927, S. C. Bruner. One female Sierra Rangel, August 28, 1927, J. Acuña and S. C. Bruner, altitude 500 - 1000 ft. One pair, Loma del Gato, Oriente, J. Acuña and S. C. Bruner, October 1. One male, Sierra Rangel, J. Acuña and A. R. Otero.

This relatively large inconspicuously colored species is apparently uncommon. Solitary individuals have been taken only occasionally among other species in sweeping woodland vegetation, except for the twelve male specimens from the Sierra Rangel which among some fifteen or more were attracted to a light placed at the edge of a forest. Two other species (*Hadria cubana* and *Hadria convertibilis*) were both common here but strangely none came to the light except one male of the latter.

There is a damaged specimen of this form in the Gundlach Museum, Havana, labeled "367, Tettigonia sp." Gundlach's records show that this was taken at Bayamo (Oriente Province); it thus appears to occur throughout the Island.

Arezzia baracoa n. sp. Figs. 20, 44.

Readily distinguishable from all other species known from Cuba by having veins of tegminae red and by general colora-

tion: Dull wine red with longitudinal buffy white and fuscous markings above on head and thorax; abdomen red above.

Head broadly triangular with crown well rounded in front, this somewhat longer than one-half basal width and less than three-fifths length of pronotum. Clypeus with disc flattened, nearly straight in lateral view, forming angle of about 75 degrees with crown, somewhat rounded above. Anteclypeus continued in plane with clypeus until just before center, then suddenly bent upward at obtuse angle. Pronotum slightly but distinctly narrower than head. Tegminae moderately broad with two relatively large anteapical cells.

Genitalia: Male, last ventral segment broader than long, about one-fourth longer than preceding segment, posterior margin straight; plates moderately broad basally tapering to slender brown points, regularly upcurved, not quite reaching apex of pygofer, sides with usual row of brown bristles and fine pale hairs.

Color: Above dull wine red with paler and fuscous markings. Crown with a broad pale buff median vitta from base to near apex with rather broad indefinite fuscous border; remainder with indefinite mottled design of dark and pale markings the disc washed with dull red. Pronotum deep wine red with broad nearly percurrent median vitta and a large patch behind eyes including lateral angles buffy white, the latter interiorly and the median vitta with indefinite fuscous border; the anterior portion of pronotum also pale buff, heavily marked with fuscous, the extreme front margin entirely pale. Scutellum largely buffy white with two indefinite curved fuscous markings basally on each side of center; postscutellum pale. Tegminae dull wine red with dark red veins, the surface largely covered with large paler maculae, these tending to form transverse bands apically; the semi-transparent apical area yellowish white; costal margin darker. Below, face pale brown; the center of disc of clypeus and sides paler, the latter with about six indefinite curved oblique parallel light fuscous bars, an indefinite fuscous median patch on clypeus above. Sternum lightly infuscate; the pleurae largely paler. Legs entirely reddish fuscous. Abdomen yellowish white, the basal portion of segments red and center more or less infuscate; the plates pale

with apices brownish. Abdomen above dull crimson. Wings infusate with darker veins.

Length: 6.5 mm.

Holotype: Male, El Yunque Mt., Baracoa, Oriente Province, April 27, 1929, S. C. Bruner and L. Bouclé, (E. E. A. de Cuba No. 10029).

We know of no other species of the *Cicadellinae* occurring in Cuba which has the veins of tegminae largely red.

Arezzia viridipennis n. sp. Figs. 21, 43.

Closely related to *Hadria oteroi* but slightly smaller and readily distinguishable from that and all other species by very different coloration: Head, anterior portion of pronotum and scutellum pale buff lightly inscribed with thin dark brown lines, the disc and remainder of pronotum heavily mottled with dark brown and washed with green; tegminae green without dark stripes.

Head large, rather short, well rounded in front, slightly broader than pronotum; crown almost twice as broad basally as long, nearly two-thirds as long as pronotum. Tegminae rather broad, provided with two very small anteapical cells, the inner cell much the larger.

Genitalia: Female, last ventral segment more than twice as long as preceding considerably produced, converging somewhat concavely to obtuse apex, this slightly sinuate on either side of very small angular median tooth; pygofer with few short scattered bristles.

Color: Crown buff slightly stained with pinkish in places and inscribed with dark brown vermiculate lines, more numerous and anastomosing on disc, a thin dark median line from base. Pronotum with anterior portion for about three-eighths of length, pale buff lightly inscribed with dark brown vermiculate lines, remainder of pronotum heavily mottled with dark brown and washed with dull green, contrasting with pale forepart.. Scutellum paler buff marked with regular design in dark brown as shown in figure; postscutellum light brown. Tegminae green with thin yellow veins, the posterior subapical cross-veins broadly paler, forming an indefinite transverse anteapical

pale line; the translucent apical area smoky; extreme apex of clavus pale; costal area anteriorly washed with yellow. Below cream white to buffy more or less marked with brown; the clypeus largely dark brown mottled with cream white or, in paler specimens, largely cream white mottled with dark brown, the sides in either case cream white with an indefinite oblique row of dashes below antennae; anteclypeus, genae and lorae cream white, the disc of former largely and markings on latter dark brown. The mesosternum sometimes with a dark brown spot. Abdomen entirely pale below or with venter more or less embrowned; above bright crimson. Wings infusate with black veins.

Length: 6—6.33 mm.

Holotype: Female, Maisi, Oriente Province, February 5, 1929, J. Acuña.

Allotype: Male, Oriente Province, September 12.

Paratypes: Female, Baracoa, Oriente Province, April 25, 1929, S. C. Bruner and L. Bouclé; Jarahueca, S. C. Bruner.

This very distinct little species is rare and apparently confined to eastern Cuba. There is a specimen in the Gundlach Museum, Havana, labeled "No. 366, *Tettigonia* sp." Records show this was taken at Baracao.

Arezzia rangeliana n. sp. Figs. 22, 46.

Resembles *Hadria convertibilis* but readily distinguishable by shorter, more obtuse head, paler, brownish coloration with narrower black stripes and by abdomen being red above, not black.

Form relatively robust. Crown short, broadly rounded in front, scarcely one-half as long as basal width and about six-tenths as long as pronotum, still shorter in male. Clypeus with disc flattened, the anteclypeus continued in same plane to center, then abruptly curved backward to apex, forming a broad rounded angle. Pronotum somewhat narrower than head across eyes, about six-tenths as long as broad. Tegminae of the usual form with two oblong anteapical cells, the inner one somewhat shorter.

Genitalia: Female, last ventral segment about four times as long as the penultimate, produced behind into a rather long

point, the apex similar to *Hadria trinitalis*, but less acute; pygofer with few short blackish bristles. Male, last ventral segment less than two-thirds as long as broad, longer than penultimate, posterior margin straight, plates moderately broad tapering to slender, upturned apices not reaching apex of pygofer; sides with usual row of blackish bristles.

Color: Above buffy yellow and light brown striped with black, the stripes on crown and thorax broken into irregular curved lines. Crown dull buffy or slightly pinkish yellow marked with somewhat variable design of irregular curved heavy black lines. Pronotum with anterior margin broadly buffy yellow, remainder light olive brown, marked with irregular, curved heavy black lines, more or less anastomosing especially in front, and tending to form three irregular vittae on either side. Scutellum concolorous with crown, marked with variable design of heavy black curved lines and spots; postscutellum paler yellow. Tegminae sepia marked along longitudinal veins with percurrent black stripes and irregular dashes between; the anterior half of costal area buffy yellow, and extreme apex of clavus pale yellow; the translucent apical area infusate; a darker fascia from costal margin across basal half of anteapical cells followed by a similar fascia of pale yellow. Below largely amber yellow. Face straw yellow marked with black and fuscous; clypeus with large irregular black spot in center above, the disc below washed with pale fuscous and sides with eight or nine more or less complete, heavy black bars. Mesosternum largely fuscous or blackish. Legs with tibiae and tarsi buffy yellow more or less washed with brown. Apex of genital segment of female and ovipositor infusate, the sides of pygofer with a smoky patch. Abdomen above bright crimson. Wings infusate.

Length: 6.3—7.5 mm.

Holotype: Female, and Allotype: Male, Las Animas, Sierra Rangel, Pinar del Río Province, altitude 1,500 ft., April 28, 1933, S. C. Bruner and A. R. Otero, on woody plants in forest.

Paratypes: Sierra Rangel, Pinar del Río, one male April 6, 1922, J. Acuña, C. H. Ballou, S. C. Bruner, (E. E. A. de Cuba No. 8775), and one female from the same region, May 1933, Hon. Roberto, Colegio "La Salle"; Taco Taco, April 1-6, 1922, S. C. Bruner and C. H. Ballou.

Entogonia Mel.

(Melichar 1926a: 360)

Orthotype *Tettigonia sagata* Signoret 1854a: 27

This genus was established for certain species of Cicadellids from the Southern United States, México, Central and South America; with broad nearly flat crowns which are more or less produced in front of eyes. Venation distinct with a distinct first radial anteapical cell.

Entogonia inexpectata n. sp. Fig. 9.

This is a small slender species of a general pale buffy color, with the head, pronotum and mesonotum striped with chestnut brown and the veins of the tegminae marked with chestnut brown. This species is suggestive of *Cicadella occatoria* Say but is somewhat smaller, duller in color and lacks the median dark vitta on the pronotum and mesonotum and the genitalia are entirely different.

Crown broad somewhat elongate, about two-thirds as long as broad; shorter than the pronotum. Head including eyes somewhat broader than pronotum. Face somewhat tumid. Tegminae narrow elongate; nearly twice as long as the abdomen; radius forked before the level of the apex of clavus; legs slender, fore and middle tibiae ciliate.

Genitalia: Male, last ventral segment nearly as long as broad, posterior margin straight; plates elongate, slender apices upturned, about half as long as the pygofer.

Color: Face, crown, pronotum and mesonotum ochraceous orange, the crown with a pair of narrow stripes which unite near the anterior margin, diverging posteriorly to form a distinct V. Outside of these a pair of broader parallel stripes which continue onto the face forming two elongate black marks. There are two short black stripes in front of eyes which continue onto the face. The markings of the crown are continued across the pronotum and the mesonotum. Tegminae warm buff; veins marked with chestnut brown, the apex suffused with chestnut. Legs and venter warm buff.

Length: 4.7 mm.

Holotype: Male, Barrio Caobilla, Camgüey, Cuba, June 23-25, 1927, J. Acuña.

Lucumius gen. n.

Orthotype *Lucumius triangularis* n. sp.

This genus has a superficial resemblance to *Xerophloea* Germ. with the head broadly triangular and the tegminae gradually attenuated giving the body a wedge shaped appearance.

Head with eyes as broad as pronotum; crown short but distinctly conically produced; clypeus broad above the sides distinctly sinuate below the eyes; anteclypeus narrow elongate, the sides nearly parallel. Pronotum broader than long; the anterior angles distinct. Scutellum large, broader than long. Tegminae coriaceous; membranes overlapping so that the apex appears very acute; venation simple, two small anteapical cells. Anterior and posterior tibiae ciliate. Male genitalia simple, aedeagus very short barely exceeding styles with a pair of short posterior processes.

Lucumius triangularis n. sp. Figs. 4, 47, 56.

This is a medium sized species with the general body color ochraceous buff with the crown, pronotum and scutellum with numerous blackish brown vermiculate lines; and the veins of the tegminae narrowly blackish brown.

Crown about one and one-half times as broad as long, conically produced; eyes not protuberant; ocelli large; face somewhat inflated. Pronotum nearly twice as broad as long; anterior margin broadly curved; posterior margin nearly straight. Principal veins of the tegminae unbranched before anteapical cells, broadly curved following the contour of the costal margin.

Genitalia: Last ventral segment of female three times as long as penultimate; posterior margin sinuate forming a broad short median lobe which terminates in a small median triangular tooth; pygofer elongate not inflated. Male genitalia with the plates elongate, triangular, longer than the pygofer.

Color: General color above and below ochraceous buff, heavily marked above with blackish brown; below, with the legs unmarked; dorsum of abdomen bright scarlet. Crown and pronotum with numerous vermiculate blackish brown lines and dashes. Scutellum with a distinct cross formed by a median vitta and a transverse fascia on the impressed line, the distal

ends of the fascia ending in vermiculate lines. Tegminae ochraceous buff with the veins blackish brown and the cells shaded with chestnut brown. Face ochraceous brown with a pair of black spots at the apex, and a black dash next the eyes; and ten chestnut brown arcs.

Length: 6.0 mm.

Holotype: Female, Camagüey, S. C. Bruner.

Allotype: male Camagüey, S. C. Bruner.

Paratypes: One male and one female, same locality.

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Same. (3) 3:49-60; pl. 6. 1855a

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PLATE III

Fig. 1. *Hortensia similis* Walk.

A. Dorsal view of head and thorax; B. Profile; C. Female genitalia; D. Male genitalia.

Fig. 2. *Hortensia flicis* M. and B.

A. Dorsal view of head and thorax; B. Profile; C. Female genitalia; D. Male genitalia.

Fig. 3. *Poeciloscarta histrio* Fabr.

A. Dorsal view of head and thorax; B. Profile; C. Female genitalia; D. Male genitalia.

Fig. 4. *Lucumius triangularis* M. and B.

A. Dorsal view of head and thorax; C. Female genitalia.

Fig. 5. *Hortensia gundlachiana* M. and B.

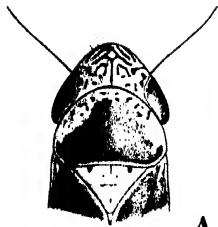
A. Dorsal view of head and thorax.

Fig. 6. *Hortensia conciliata* M. and B.

A. Dorsal view of head and thorax.

Fig. 7. *Poeciloscarta laticeps* M. and B.

A. Dorsal view of head and thorax; B. Profile; C. Female genitalia; D. Male genitalia.



A

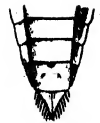


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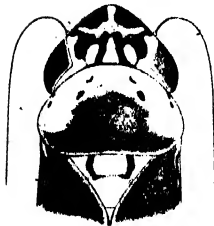
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4 A



A



B

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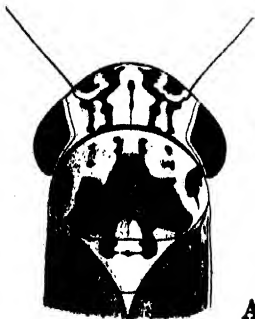
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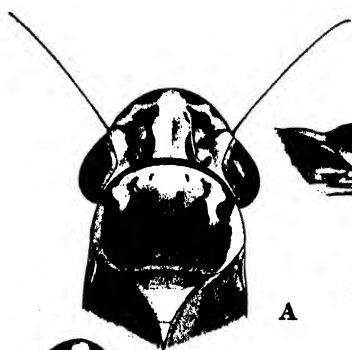
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PLATE IV.

- Fig. 8. *Poeciloscarta cardini* M. and B.
A. Dorsal view of head and thorax; B. Profile; C.
Female genitalia; D. Male genitalia.
- Fig. 9. *Entogonia inexpectata* M. and B.
A. Dorsal view of head and thorax.
- Fig. 10. *Hadria trinitalis* M. and B.
A. Dorsal view of head and thorax; B. Profile; C.
Female genitalia; D. Male genitalia.
- Fig. 11. *Hadria convertibilis* M. and B.
A. Dorsal view of head and thorax; B. Profile; C.
Female genitalia; D. Male genitalia.
- Fig. 12. *Arezzia maestralis* M. and B.
A. Dorsal view of head and thorax; B. Profile; C.
Female genitalia; D. Male genitalia.



8



A

B



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D



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A



B

10



C



D



A



B

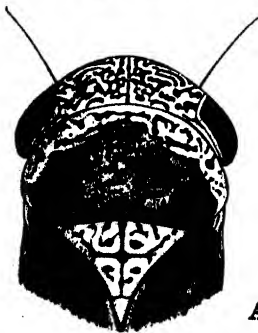
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C



D

PLATE V.

Fig. 13. *Hadria cubana* M. and B.

A. Dorsal view of head and thorax; B. Profile; C. Female genitalia; E. Face.

Fig. 14. *Kolla fasciata* Walk.

A. Dorsal view of head and thorax; B. Profile; C. Female genitalia; D. Male genitalia.

Fig 15. *Hadria labyrinthica* M. and B.

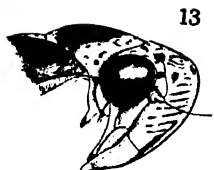
A. Dorsal view of head and thorax; B. Profile; C. Female genitalia; E. Face.

Fig. 16. *Hadria balloui* M. and B.

A. Dorsal view of head and thorax; B. Profile; C. Female genitalia; D. Male genitalia .



A



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B



E



C

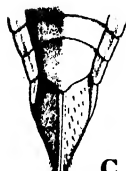


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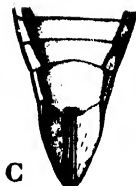


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C



A



16

B



E



C

D

PLATE VI.

Fig. 17. *Arezzia omaja* M. and B.

A. Dorsal view of head and thorax; B. Profile; C. Female genitalia; E. Face.

Fig. 18. *Hadria oteroi* M. and B.

A. Dorsal view of head and thorax; B. Profile; C. Female genitalia; E. Face.

Fig. 19. *Arezzia anachoreta* M. and B.

A. Dorsal view of head and thorax; B. Profile; C. Female genitalia; E. Face.

Fig. 20. *Arezzia baracoa* M. and B.

A. Dorsal view of head and thorax; B. Profile; D. male genitalia; E. Face.

Fig. 21. *Arezzia viridipennis* M. and B.

A. Dorsal view of head and thorax; B. Profile; C. Female genitalia; E. Face.

Fig. 22. *Arezzia rangeliana* M. and B.

A. Dorsal view of head and thorax; B. Profile; C. Female genitalia; D. Male genitalia.



A



B

17



E



C



A



B

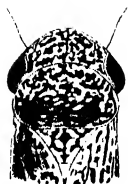
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E



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19



E



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21 C



21 A



A



B

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E



D



21

B



E



A



B

22



C



D

PLATE VII.

Internal Male Genitalia

- Fig. 23. *Draeculacephala cubana* M. and B.
- Fig. 24. *Carneocephala flaviceps* Riley
- Fig. 25. *Carneocephala reticulata* Sign.
- Fig. 26. *Hortensia filicis* M. and B.
- Fig. 27. *Poeciloscarta cardini* M. and B.
- Fig. 28. *Kolla fasciata* Walk.
- Fig. 29. *Poeciloscarta histrio* var. *baraguensis* M. and B.
- Fig. 30. *Poeciloscarta laticeps* M. and B.
- Fig. 31. *Hortensia similis* Walk.
- Fig. 32. *Hadria convertibilis* var. *roigi* M. and B.
- Fig. 33. *Poeciloscarta histrio* Fabr.
- Fig. 34. *Ciminius harti* Ball
- Fig. 35. *Hadria convertibilis* M. and B.
- Fig. 36. *Kolla carabela* M. and B.
- Fig. 37. *Hadria balloui* M. and B.
- Fig. 38. *Hadria cubana* M. and B.

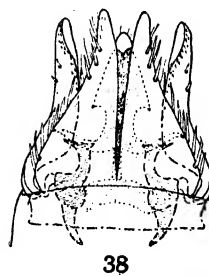
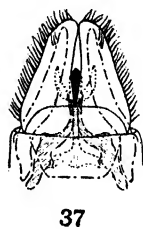
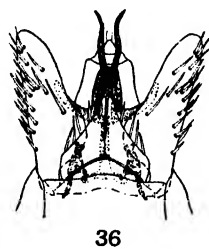
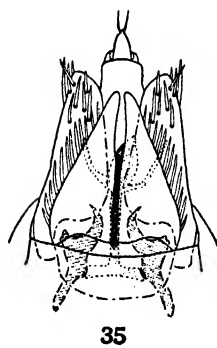
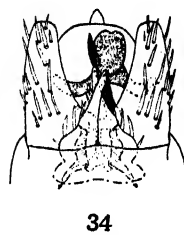
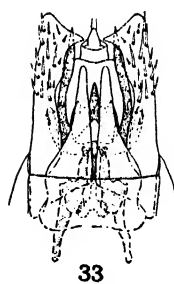
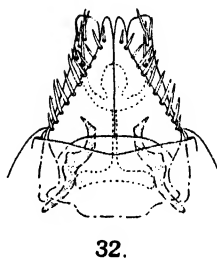
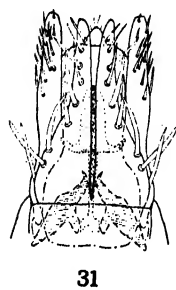
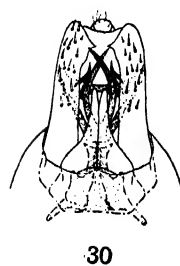
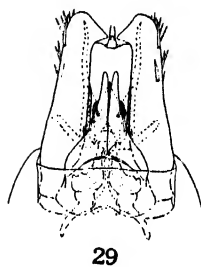
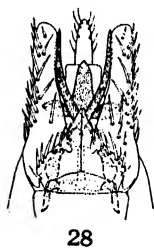
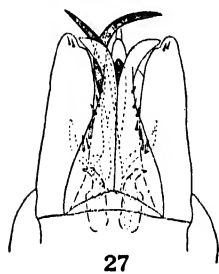
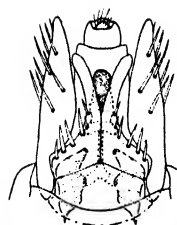
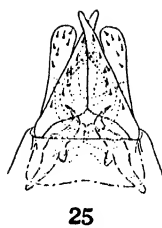
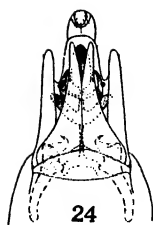
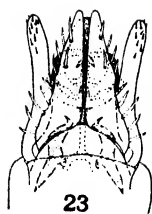
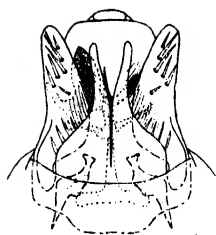


PLATE VIII.

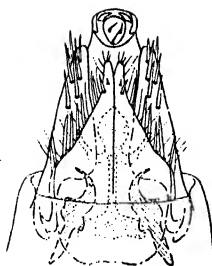
Internal Male Genitalia

- Fig. 39. *Arezzia omaja* M. and B.
Fig. 40. *Hadria labyrinthica* M. and B.
Fig. 41. *Arezzia maestralis* M. and B.
Fig. 42. *Arezzia anachoreta* M. and B.
Fig. 43. *Arezzia viridipennis* M. and B.
Fig. 44. *Arezzia baracoa* M. and B.
Fig. 45. *Hadria trinitalis* M. and B.
Fig. 46. *Arezzia rangeli* M. and B.
Fig. 47. *Lucumius triangularis* M. and B.
Tegminae
Fig. 48. *Draeculacephala cubana* M. and B.
Fig. 49. *Hortensia similis* Walk.
Fig. 50. *Poeciloscarta histrio* Fabr.
Fig. 51. *Cicadella viridis* Linne. (Palearctic and Nearctic species.)
Fig. 52. *Kolla carabela* M. and B.
Fig. 53. *Ciminius harti* Ball.
Fig. 54. *Hadria convertibilis* M. and B.
Fig. 55. *Arezzia maestralis* M. and B.
Fig. 56. *Lucumius triangularis* M. and B.

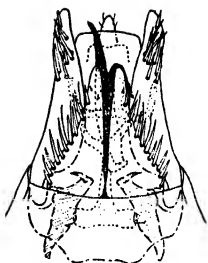
(The cubital vein is omitted)



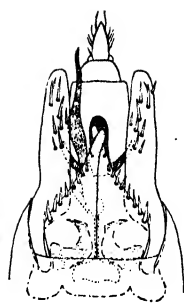
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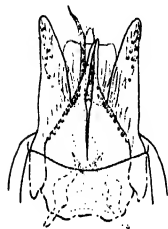
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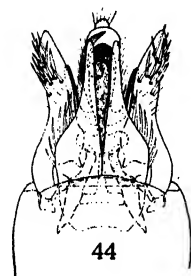
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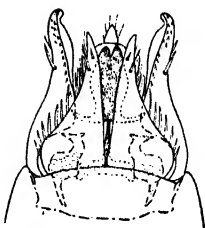
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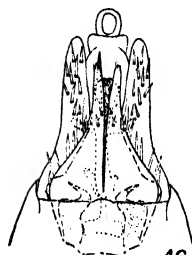
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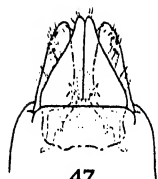
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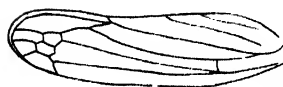
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